



Used-Car Plan Factory Banned

Sales Heads View NADA Plan as Impractical and of Doubtful Legality

"Idealistic" and "unworkable," was the comment of factory executives on the 20 per cent used car gross profit plan approved by directors of the National Automobile Dealers' Association at their annual meeting in New Orleans last week.

Expressions such as these do not augur well for factory cooperation, upon which success of the plan is predicated.

Manufacturers voiced wholehearted approval of the aims of the new program, but held widely divergent views with the N.A.D.A. on its "modus operandi." In the first place, they consider the 20 per cent gross profit too high in view of prevailing dealer discounts, which in general presume an over-all fair profit for dealers on a break-even basis for used car operations. At any rate, a uniform plan for all dealer bodies is considered highly impractical with the present wide range in discounts. To peg the cost of distribution when there is universal demand for lower cost is regarded as uneconomic and not compatible with a sound and efficient business.

Another stumbling block to factory approval is the method proposed for financing the dealers' Used Car Auditing Board by billing dealers at the rate of \$2 per new car shipped. "I can't imagine any factory acting as a collection agency for the dealer organization," said one official. "We would never consider for a minute that \$2 charge per car," was the emphatic protest of another.

Individual action by manufacturers to put the plan in operation, even if acceptable in its details, is considered highly improbable. Such a step, it was declared, would immediately place a company and its dealers at a com-

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Will "All Three" Compete On Low Monthly Payments?

The use of low monthly payments as a competitive weapon in the low-price automobile field has been a threat perennially overhanging the motor industry. Resorted to at various times in the past, it again has come to the fore and looms as an important factor in

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"Educate drivers—not terrify them"

Leaders of the automobile industry met at A.M.A. headquarters in New York Tuesday to institute safety education campaign. Seated: Alfred P. Sloan, Jr., president of General Motors (left); Paul G. Hoffman, president of Studebaker; standing, left to right, F. B. Davis, Jr., president of U. S. Rubber; Fred C. Wacker, president of the M.E.M.A., and Lee J. Eastman, vice-president of Packard

Output Rate Based on Car Stock Level

Factories Must Decide Whether to Warehouse Cars or Cut Production

By HAROLD E. GRONSETH

Despite curtailment in some quarters, the motor industry as a whole is maintaining a high level of production which should result in a current month's output of somewhere in the neighborhood of 375,000 cars and trucks, or less than 10 per cent reduction from the December total. A further slight easing in the operating rate is anticipated next month which, with its fewer days, should bring the February output down another five to ten per cent.

The operating rate over the next few weeks is contingent upon whether or not the manufacturers decide to warehouse cars until the heavier spring demand opens up. That question is under consideration now that dealers have accumulated fairly heavy stocks of new cars and their capital is also tied up in heavier used-car inventories than are normal for this time of the year. Should the factories decide to warehouse a considerable portion of their output over the next few weeks, probabilities are that operations will be maintained at about the present level through April.

Present plans of leading manufacturers call for peak stocks being reached about Mar. 1, after which for a month it is expected retail sales and production will be in balance. The process of liquidating accumulated stocks should begin about April 1, and continue for the next six months until production is again under way on 1937 cars.

Used-car stocks of dealers have been climbing ever since new models were introduced last fall and are expected to continue.

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AMA Backs Wide Safety Campaign

Traffic Accident Control Will Be Furthered Through Local Educational Programs

All branches of the automotive industry joined this week in a nationwide effort to reduce traffic accidents through a program coordinated by the Safety Traffic Committee of the Automobile Manufacturers Association. The entire motor industry is underwriting the cost of specific projects to be sponsored by the cooperating organizations in order to give additional impetus to their present safety activities.

The essence of the plan is to secure the widest possible publicity and education of the public. Stimulation of inter-city safety contests; renewal of public school safety essay, and safety lesson contests; expansion of school-boy patrol and high school driver training work; vigorous support of law enforcement; dissemination of films, literature and educational material in a wide range of contacts with state and local civic and fraternal groups; assistance in the training of traffic control personnel; and more effective cooperation from all agencies concerned through automobile dealers and car owners—these will all be features of the safety activities.

In an initial effort to get the program before the public, Paul G. Hoffman, president of Studebaker Corp., and head of the A.M.A. safety traffic committee, and Alfred H. Swayne, vice-president of the association and of General Motors, delivered radio addresses on Tuesday night, while newsreel shorts of Mr. Hoffman, Alfred P. Sloan, Jr., president of General Motors, and others, were made at the offices of the association when the campaign was launched.

Among the improvements sought by the industry are better and safer cars, merchandising which will stress the safety factor, elimination of unsafe

cars, properly conditioned cars, better highways, sound traffic control, protection of the young, and cooperation with police to eliminate ticket dodgers, reckless drivers, and drunken operators.

The industry opposes speed governors, pointing out among other things that 90 per cent of the accidents occur below 50 miles an hour, and that governors cannot control weather conditions which frequently make driving unsafe at 30 miles an hour.

An announcement by Alvan Macaulay, president of the association, gave the following as a partial list of the major organizations promising aid:

- American Association of Motor Vehicle Administrators.
- American Association of State Highway Officials.
- American Automobile Association.
- American Legion.
- General Federation of Women's Clubs.
- Highway Education Board.
- International Association of Police Chiefs.
- National Bureau of Surety & Casualty Underwriters.
- National Congress of Parents and Teachers.
- National Grange.
- National Safety Council.
- U. S. Bureau of Public Roads.
- U. S. Department of Commerce.
- U. S. Office of Education.

Plymouth Used-Car Radio Program Stresses "Truth"

Through the medium of "Truth" Barlow, new radio personality, Plymouth went on the air this week with a thrice weekly program designed to send prospects to all Plymouth dealers in search of good used cars. The program, electrically transcribed, will be on 82 key stations as time becomes available on the air. Mentioning Plymouth only, the program is designed to be of assistance to all Chrysler Corp. dealers because of the fact that they all handle Plymouth cars. The program is expected to continue for an indefinite period.

Consisting of music and patter with Barlow as master of ceremonies, the presentation will be designed to build up in the minds of listeners association of truth in merchandising with used cars sold by Plymouth dealers. Brochures explaining the program are being sent to all Plymouth dealers and consumer material calling attention to the program is being prepared.

Thompson Products to Refund 7% Preferred

Stockholders of the Thompson Products Co. at a special meeting this week approved a proposed recapitalization plan to replace the 7 per cent preferred stock with a 5 per cent issue, and to increase authorized amount of common.

The plan creates 10,000 shares of

prior preference stock which will be exchanged for the outstanding 7 per cent preferred at the rate of 1.1 shares of new for each share of old. Stock not exchanged will be called at \$110 and accrued dividends. New stock will be convertible into common at \$100 a share for the preference and not less than \$30 a share for the common and will be callable at \$105 and accrued dividends.

Common stock will be increased from 300,000 to 500,000 shares, no par, with the added shares being held for conversion, and common shareholders waiving their preemptive rights to purchase. New prior preference stock not taken by preferred shareholders on the exchange offer will be sold to underwriters at not less than \$96 a share.

SAE Metro Section Hears Gar Wood Tell of New Boat

Officially opening the New York Motor Boat Show for automotive men, the annual motor boat dinner and meeting of the Metropolitan Section of the S.A.E. was held Monday evening.

Feature addresses of the meeting were by Gar Wood, motor boat manufacturer, and Charles P. Burgess, of the Bureau of Aeronautics. Motion picture films showed the construction of Gar Wood's "Miss America X," holder of the world speed record. Lively discussion of both talks followed. David Beecroft acted as chairman at the dinner, introducing prominent guests, among whom were: Vincent Bendix, J. F. Winchester, John A. C. Warner, Ralph Teetor, W. E. John, and Ira Hand.

Attendance at the show in Grand Central Palace was reported much higher than in recent years, with the public backing up its interest with numerous orders. Exhibits included all varieties of craft, from a baby sailboat for children to the 56 ft. Wheeler "Playmate," flag-ship of the show. Some of the novelties were a cellophane sail, and a pedal-propelled boat.

"As safe in car as in home"

"Any driver is almost as safe in his automobile . . . as he is in his house, according to official accident records. . . . But for our part we will not be satisfied until the public is even safer in a vehicle or on the street than at home.

"The average motorist, if you disregard other hazards of life, can live 9000 years before actuarial facts indicate probability of fatal accident.

"The ticket-fixer and the driver who drinks' are the most dangerous traffic offenders."

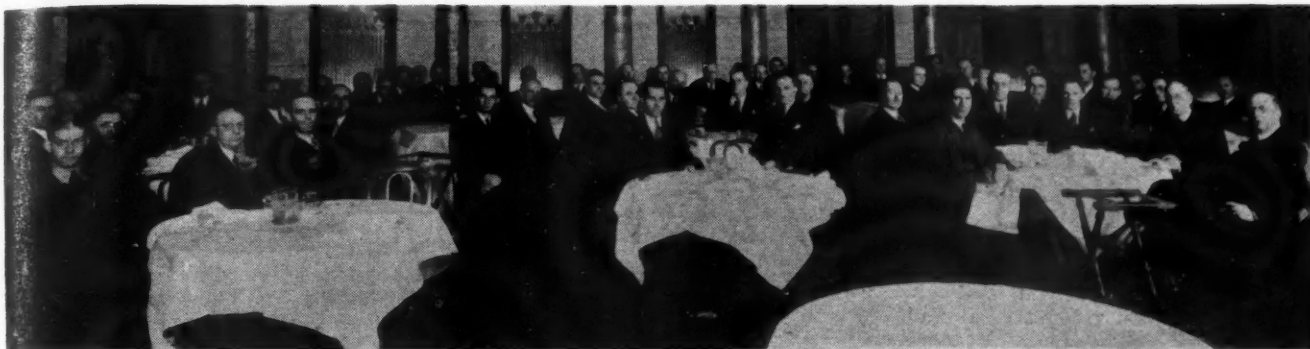
From a radio interview by Boake Carter with Paul G. Hoffman.

"Haste, not speed, causes accidents"

"I wish we could alter the scale we use to designate speeds. Instead of saying, 'We are driving 50 miles an hour,' we should say, 'We are driving at 166 ft. stopping distance.'

"What the modern driver needs is exactly what the progressive high school course is giving the youngster: a sound knowledge of the machine and its performance; a better sense of timing and distances; a keener driving judgment; a knowledge of, and an acceptance of, the margin of safety."

From an interview with Alfred P. Sloan, Jr., in the February "Good Housekeeping."



First dinner-meeting of the Southern New England Section of the S.A.E., at Hartford, Conn., Jan. 16.

Price Cutting Felt On Steel Tonnage

Automotive Buying Holds Production Up While Mills Await Revival of Orders

Automotive takings of steel continue to permit a good many of the finishing mills, especially so in the Cleveland and Detroit areas, to operate at a relatively high rate. Having adopted the extent of automobile assemblies as a yardstick for measuring new business overhanging the market, the steel market perceives a corresponding slackening in nearby fresh buying. Finishing mill backlogs suffice on the whole to bridge the gap between the lull and the confidently looked for revival of fresh buying toward the end of the current quarter. An outstanding feature of the market is price irregularity in flat steels. Cold rolled strip steel was reported to be obtainable this week at 2.45c., both f.o.b. Cleveland and Detroit. When price-cutting first made itself felt in the Detroit market, it was said that the \$3 per ton concession was confined strictly to large tonnage business in that district. Cleveland parts makers, so it was said, would have to pay the full price of 2.60c. f.o.b. their city. Michigan automobile manufacturers were said to have offered to supply their Cleveland parts makers with cold rolled strip at the 2.45c. rate, and this resulted in some of the large Cleveland consumers being quoted the same price. The raggedness of the market for cold rolled strip is, of course, reflected in that for hot rolled and to some extent also in negotiations for tonnage business in sheets. Demand for steel bars from Middle West tractor manufacturers is on the uptrend. Automotive alloy steel specialists continue to enjoy a fair volume of demand. Takings of wire by wheel manufacturers are well maintained.

Pig Iron—Demand from Middle West automotive foundries continues good. Blast furnace interests with their sales territory in both the Middle West and near the Atlantic seaboard are especially gratified because the competition of foreign iron, encountered by them in the latter markets, can not gain a foothold inland because of high freight costs. Prices are unchanged.

Aluminum—Piston and cylinder-head demand for aluminum continues brisk. Prices for both primary and secondary metal and alloys are unchanged, with the tone of the market steady.

Copper—Bookings for domestic consumption, which were backwards earlier in the month, have now expanded to in excess of 20,000 tons. The market is of a routine character, with the price of electrolytic unchanged at 9½ cents, delivered Connecticut point.

Tin—The death of King George, resulting in trading suspension on the London and Singapore exchanges, slowed up business here as well. The lowest bid submitted on 300,000 lb. of Grade A tin, inquired for by the United States Navy Department, was 45½ cents, less ½ per cent discount for cash in ten days. The week's opening price for spot Straits tin was 46½ cents, approximately ½ cent below the preceding week's close.

Lead—Storage battery manufacturers have been consistent takers of metal for nearby delivery. The market is firm.

Zinc—Dull and unchanged.

Dodge Now Offers 6% Plan to Commercial Car Buyers

Pioneering another innovation, Dodge now offers the low-priced 6 per cent time-payment plan to buyers of the new 1936 trucks and commercial cars, according to announcement by J. D. Burke, director of truck sales for the Dodge division of Chrysler Corp. It is the same arrangement as that under which passenger cars are being sold.

"This 6 per cent plan represents a radical departure from the conventional interest charges on the deferred payments on trucks and commercial cars," said Mr. Burke, "and we feel confident its advantages will have a wide public appeal and appreciation. There is no reason why trucks should not be sold on the low per cent time-payment plan, the same as passenger cars. We believe this new arrangement will be met with enthusiasm by truck buyers all over the country."

The City of Louisville, Ky., plans to spend about \$45,000 for automotive equipment during the year. Fifteen passenger cars and eight trucks are among the vehicles to be purchased in the near future.

40 Years Ago

—with the ancestors of
AUTOMOTIVE INDUSTRIES

Barnum and Bailey's "Greatest Show on Earth" is to exhibit a Duryea motor wagon through the country next season.

—From the *Horseless Age*, January, 1896.

Southern N. E. Section of S.A.E. Meets at Hartford

The first meeting of the newly organized Southern New England Section of the S.A.E. was held at the Bond Hotel, Hartford, on Jan. 16. It was attended by more than 50 members. The feature of the technical session was the showing of a talking moving picture on the manufacture of springs of all types produced by the Wallace Barnes Co. The presentation of the film was made by J. E. Andrews, president and general manager of the Wallace Barnes Co., who also conducted the period of discussion which followed the showing of the film.

Frank P. Gilligan, secretary and treasurer of the Henry Souther Engineering Corp., is the chairman of the new section and presided. The other officers are: Arthur T. Murray, president, United American Bosch Corp., Springfield, Mass., vice-chairman; T. C. Delaval-Crow, chief engineer, New Departure Mfg. Co., Bristol, Conn., treasurer; E. P. Blanchard, sales manager, Bullard Co., Bridgeport, Conn., secretary; Dwight R. Judson, of Dwight R. Judson Co., social secretary.

Republic Steel's General Offices Move to Cleveland

Effective Jan. 25, the general offices of Republic Steel Corp. will be removed from Youngstown, Ohio, to Cleveland, Ohio, it is announced by T. M. Girdler, president and chairman of the board of Republic. The offices will occupy floors 13 to 16 inclusive in the former Medical Arts Bldg., recently renamed the Republic Bldg.

The move consolidates the general offices which have been located in Youngstown, the executive and Cleveland district sales offices formerly in the Union Trust Bldg., Cleveland, and the Advertising Dept., Massillon, Ohio. The sales offices of the Newton Steel Company will also be located in the Republic Bldg., Cleveland.

New York Stock Exchange authorized this week the listing of 195,627 additional common shares without par value of the Motor Products Corp. This makes a total of 391,254 common shares of the corporation to be listed.

Franklin Plant Option Hangs as Foreclosure Pends

The status of the former H. H. Franklin Manufacturing Co. plant at Syracuse remained unsettled following inspection of the property by Arthur J. Brandt, of Detroit, president of A. J. Brandt, Inc., reported to represent principals interested in manufacturing an air-cooled engine line.

Accompanied by Gordon Lefebvre, Mr. Brandt passed a day at the plant, which is in the possession of Franklin Motors, Inc. Leaving, he said that he would return soon to the city. He consulted at Detroit and Syracuse with representatives of the Domarks interests which have a cast-in-block air-cooled engine, developed by Carl T. Doman and Edward S. Marks, of Syracuse, and formerly of Amesbury, Mass. H. J. Leonard, president of Franklin Motors, Inc., has signed an agreement with Mr. Brandt, good for 60 days, to sell if Mr. Brandt desires.

Meanwhile foreclosure proceedings by the City of Syracuse on a lien of \$300,000 for taxes for three years have been held temporarily in abeyance. The city administration had earlier offered a compromise of tax arrears to Franklin Motors, Inc., upon condition of renewal of operations in the plant, unused since the H. H. Franklin Manufacturing Co. entered receivership April 1, 1934.

Trial of an injunction action by Dallas E. Winslow, Inc., against Franklin Motors, Inc., meanwhile is also pending. A temporary injunction has been granted to the plaintiff directing the defendant not to interfere with his leased occupancy of Franklin plant space nor his operations there, until determination of the permanent injunction case.

The Franklin plant was assessed at \$3,600,000 on the 1935 tax rolls and is assessed at \$2,650,000 this year.

Edsel Ford Organizes Charitable Foundation

Articles of incorporation for a charitable organization known as the "Ford Foundation" have been filed in Lansing,

Mich., by Edsel Ford. Purposes of the organization were given as "partially to receive and administer funds for scientific, educational, and charitable purposes, or for the public welfare," and it was stated that it is to be financed by contributions of funds and property. Assets were listed at \$25,000. Directors are Edsel Ford, B. J. Craig, secretary and assistant treasurer of Ford Motor Co., and Clifford B. Longley, Ford attorney. Headquarters of the organization were given as the Ford Engineering Laboratories, Dearborn.

Work Started on GM's New Los Angeles Assembly Plant

Contracts for the construction of the new General Motors assembly plant in Los Angeles, announced several weeks ago, have been let and preliminary work has been started, General Motors officials announced in Detroit this week.

The new plant will be located on a tract of approximately forty acres at Alameda Street and Tweedy Road, in Los Angeles County, adjoining the city of South Gate. It will be known as the Argonaut Manufacturing Division of General Motors Corp. Pontiac, Oldsmobile and Buick automobiles for Pacific Coast delivery will be assembled in the new factory.

The plant will consist of three structures: the factory building; the office building and a loading shipping dock. In addition there will be oil storage and sprinkler tanks. An oval test tract three-eighths of a mile around will be located in the rear of the main building. The factory building, which will face north, will be 560 ft. wide and 800 ft. long. The total floor area in the factory building will be 541,000 square feet.

The plant will have an initial capacity of between 40,000 and 50,000 cars a year. It is estimated that the number of workmen required will be 1,500.

The American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind., has recently expanded its plant facilities to take care of the increase in business caused by the demand for the American "Wheelabrator," the airless abrasive cleaning equipment, as well as for the other products of the company.

FTC Seeks Broader Power Over Business

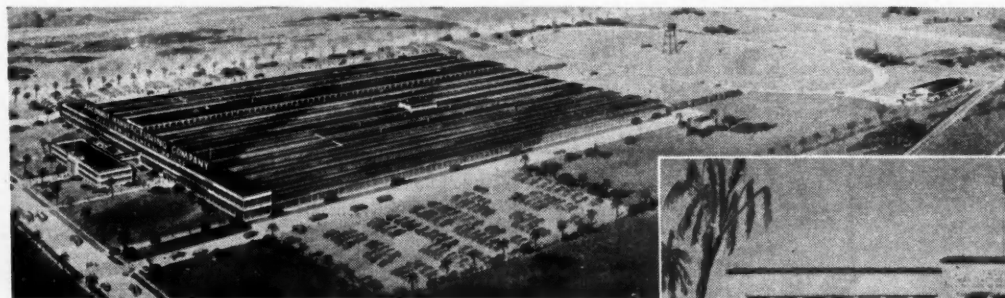
Dictatorial Control Greater Than NRA Would Be Granted Under Proposed Legislation

Extremely broad powers which would permit the Federal Trade Commission to go on "fishing expeditions" into affairs of individuals, partnerships, corporations, and associations are proposed in a bill just introduced by Representative Rayburn, Democrat, of Texas, chairman of the House committee on interstate and foreign commerce. A similar measure will be sponsored in the Senate by Senator Wheeler, Democrat, of Montana, chairman of the Senate committee on commerce. Critics of the bill say that it would give the F. T. C. greater control over business and industry than that once exercised by the N.R.A.

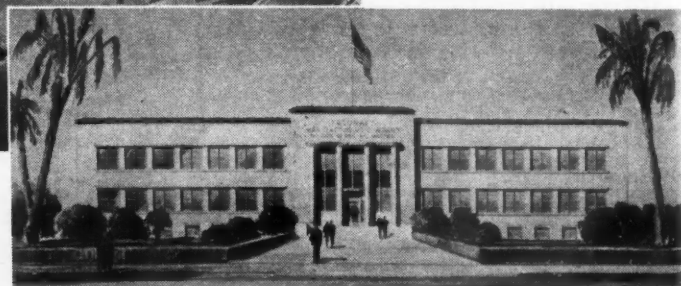
The measure has been offered in part as an amendment to Sect. 5 of the Federal Trade Commission Act, and would make unlawful "unfair methods of competition in commerce, and unfair or deceptive acts and practices in commerce." In thus supplementing the present power of the F. T. C. over unfair methods of competition, it would give a like control over "unfair or deceptive practices" which would be determined arbitrarily by the F. T. C. itself, and made subject to cease-and-desist orders. Such legislation has been urged by the F. T. C. itself in its last two annual reports.

Efforts will be made to pass this legislation at the present session of Congress. It is as yet undecided whether hearings will be held, but if so, the proposed bill will undoubtedly be vigorously opposed by business and industrial interests.

With its proposed new powers, the F. T. C. would be able to ignore the matter of competition, which it must now take into consideration, and could bar any practice, which in its own judgment, it might hold to be unfair or deceptive. Some lawyers who have studied the bill say that it would give the F. T. C. practically unlimited



The Argonaut Manufacturing Division of General Motors, Los Angeles, with the office building in front, and three-eighth mile test track behind. Lower view shows the facade of the office building

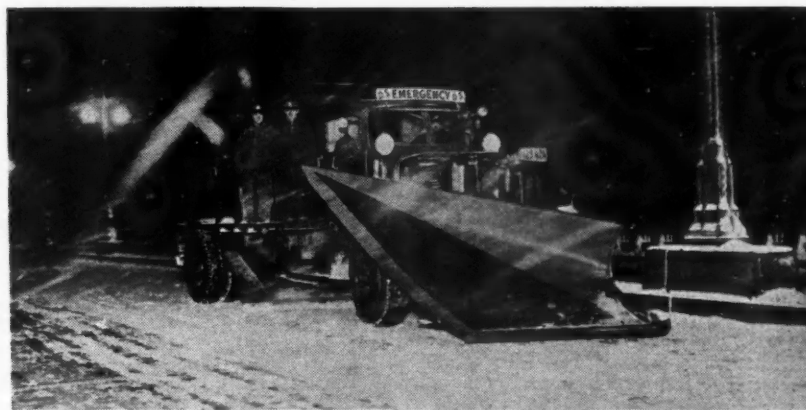


power. It could even be extended to advertising—not simply false advertising over which it now has rightful jurisdiction—but any advertising which the F. T. C. might itself hold to be exaggerated or “unfair.”

While hearings on complaints would be permissible, the commission itself would be prosecutor, witness, jury, and judge. It would be empowered, upon deciding a practice to be “unfair or deceptive,” to serve a complaint stating its charge in that respect, and giving notice of a hearing to be held at least 30 days after the service of such complaint. Following the hearing it could issue a “cease-and-desist” order. Until a transcript of the hearings is filed in the Circuit Court of Appeals the commission could modify or set aside any report or order made. If the F. T. C. has reason to believe that the order is being disobeyed, it could apply to the Circuit Court for enforcement of the order. Notice of filing of the application and record would be served by the court which would take jurisdiction, but findings of the commission as to the facts, if supported by evidence, would be conclusive. To the extent that the order of the commission would be affirmed, the court would issue its own order, commanding obedience to the commission's order.

The snooping powers of the commission would be broadened through amendments to Sect. 6 of its act, so that it would have power upon direction of the President or either branch of Congress, or upon its own initiative to require any person, partnership or corporation engaged in commerce, except banks and railroads, to file with

the commission in such form as the commission may prescribe, annual or special reports furnishing such information as the commission may require “as to the organization, business, conduct, practice, management, and relation to other corporations, partnerships, and individuals.” The attorney-general could apply to the commission to “investigate and make recommendations for readjustment of the business of any person, partnership, or corporation.” The commission or its agents would be given access to all the records of business firms, and the bill is so broadly phrased that this could be done even upon mere suspicion, or affected suspicion, of “unfair or deceptive” acts, a phrase which is not even remotely defined, or its definitions attempted, in the proposed legislation.



New York City fought the blizzard this week with this new giant snow-plow

Last Year's Production Exceeded All Previous Years, Except 1929

A year ago, predictions of a 20 per cent increase in production in 1935 were considered optimistic. The final compilation of production figures, just completed by the Bureau of the Census, Department of Commerce, shows that the increase was actually 45 per cent, total for the year being 4,182,491,

against 2,869,963 in 1934. Last December's production was only two per cent above that of November, but was 170 per cent higher than the previous December. Last year's output was the highest since 1929, when 5,621,715 cars were produced. It was 19 per cent higher than 1930.

Car and Truck Production—U. S. and Canada

	Dec., 1935	Nov., 1935	Dec., 1934	Twelve Months, 1935	Twelve Months, 1934
Passenger Cars—U. S. and Canada:					
Domestic Market—U. S.	322,096	314,566	.....	3,042,933	.....
Foreign Market—U. S.	22,517	23,859	.....	242,903	.....
Canada	11,370	12,042	2,443	139,742	92,647
Total	355,983	350,467	113,504	3,425,578	2,270,566
Trucks—U. S. and Canada:					
Domestic Market—U. S.	48,885	49,427	.....	571,086	.....
Foreign Market—U. S.	14,306	10,172	.....	152,574	.....
Canada	2,405	1,454	251	33,253	24,205
Total	65,596	61,053	42,814	756,913	599,397
Total—Domestic Market—U. S.	370,981	363,993	.....	3,614,019	.....
Total—Foreign Market—U. S.	36,823	34,031	.....	395,477	.....
Total—Canada	13,775	13,496	2,694	172,995	116,852
Total—Cars and Trucks—U. S. and Canada	421,579	411,520	156,318	4,182,491	2,869,963

Hugh Perry Is Packard's New Secretary-Treasurer

Announcement of the resignation of M. A. Cudlip as vice-president and secretary of the Packard Motor Car Co. is made by Alvan Macauley, president of Packard. “He has been with us nearly eighteen years and leaves with our very best wishes for success in his new venture,” said Mr. Macauley in making public Mr. Cudlip's resignation. Mr. Macauley at the same time announced that Hugh J. Perry has been promoted to secretary as well as treasurer of the company. A. C. Bennett was named assistant secretary and assistant treasurer.

J. C. Ferguson

John C. Ferguson, former president of the Eclipse Machine Co., died Jan. 7, at the age of 67, as the result of a heart attack suffered a few days previous. Mr. Ferguson entered the employ of the Eclipse Bicycle Co. in 1894, and continued with the company when it moved to Elmira. He became general manager in 1913, and assumed the presidency in 1928. In 1933 he retired from this position but continued to work with Eclipse Textile Devices, Inc., a subsidiary of Eclipse Machine Co.

Chrysler to Make Parts in Old Wills Ste. Clair Plant

Chrysler Corp. plans to operate the old Wills Ste. Clair plant at Marysville, Mich., acquired last summer as a service parts plant, at least for a time. Eventually it is expected to become a part of the Plymouth manufacturing facilities. An addition to the plant is being made which will add 15,000 sq. ft. of floor space.

Alden's Condition Serious

Col. Herbert W. Alden, chairman of the board of Timken-Detroit Axle Co., is in a temporarily serious condition in Harper Hospital, Detroit, as result of injury received in the factory laboratory last Wednesday afternoon.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

Despite the unsettlement attending the collapse of the Government's farm program, general business activity continued upward last week. Both wholesale and retail trade made a good showing. Commodity markets were quiet, undoubtedly reflecting the uncertainty surrounding the Administration's future action in connection with crop control.

Carloadings Continue to Rise

Railway freight loading during the week ended Jan. 11 totaled 615,028 cars, which marks a gain of 73,044 cars above those during the preceding week, an increase of 61,510 cars above those a year ago, and an increase of 57,762 cars above those two years ago.

Electrical Output Above Last Year

Production of electricity by the electric light and power industry in the United States during the week ended Jan. 11 was 11.2 per cent above that in the corresponding period last year.

Federal Reserve Index

According to the Board of Governors of the Federal Reserve System, department store sales in December increased by more than the usual seasonal amount. The adjusted index for that month stood at 84, based on the 1923-25 average as 100, as compared with 81 for November. The aggregate value of December sales was 6 per cent above that in December, 1934.

Building Contracts Rising

Total construction contracts awarded in 37 eastern States during December, according to the F. W. Dodge Corp., amounted to \$264,136,500, as against \$92,684,900 in December, 1934. Residential building for the entire year 1935 was the largest since 1931.

Chain-Store Sales Up 10%

Sales of 22 store chains, including two mail order houses, during December showed an increase of about 9.8 per cent above those in the corresponding period in 1934. Sales of these same companies for the entire year 1935 were 10.6 per cent above those in 1934.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended Jan. 18 stood at 83.8, as against 84.4 the week before and 84.0 two weeks before. The current figure is the lowest reported since the middle of last August.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Jan. 15 showed no changes in holdings of discounted bills, bills bought in the open market, and Government securities. Money in circulation declined \$61,000,000, and the monetary gold stock increased \$14,000,000.

ment in the original equipment division has increased 5.6 per cent, man hours worked increased 13.7 per cent and the average rate per hour went up 5.7c per hour.

Sales volume for the parts industry, according to Mr. Skinner, has increased 17.42 per cent for the year ending June 30, 1935, over the year ending June 30, 1934. On this basis, the sales volume of the industry for the year ending June 30, 1935, amounts to \$644,000,000. Of this total approximately 72 per cent is sold to the car manufacturer as original equipment.

W-O Gets Permit to Build 15,000 More

Bondholders' Group Hopes For Early Agreement on Plan for Reorganization

Manufacture of 15,000 additional cars and authority to issue \$750,000 of receiver's certificates to finance Willys-Overland operations was granted by Federal Court to the receiver, David R. Wilson. The order is to be completed before Sept. 1.

At the court hearing brought about by objection of the National City Bank, New York, trustee under the mortgage bond issue, it was stated by Sigmund Sanger, attorney for the receiver, that negotiations have gone far enough so that some plan for reorganizing the company can go through. He indicated that definite announcement may be made shortly. The court took cognizance of the increase in value of bonds from \$25 to \$70 during receivership as indicating value of operations to bondholders.

Significant was approval of the operating plan by attorneys for the bondholders' protective committee representing 52 per cent of the bondholders.

L. O. Long, head of plant accounting department, testified that in making 20,428 cars since the beginning of receivership and up to close of 1935, total sales had been \$6,860,642 and expense of operation, \$6,249,872. Setting up taxes and depreciation, there would have resulted a loss of \$249,427. It was estimated it would cost \$20,000 a month, not including taxes, to maintain the property.

Cash impounded from sale of properties at Elmira, N. Y., and Kansas City, Mo., amounts to about \$1,100,000. Machinery purchased for six-cylinder cars has been sold, and that retained is sufficient to make 60,000 to 100,000 four-cylinder cars annually, testimony showed.

Receiver Wilson said 6060 cars in advance of the new authorization have already been ordered by dealers. Under the court approval, the receiver gets \$50 per car in advance. Court set minimum selling price for coupe, \$365 at factory and \$267.97 for parts and materials for assembly elsewhere. Sedan and panel delivery model minimum is \$385 at factory and \$286.15 for parts.

Trade Groups Condole Harry Horning's Family

Resolutions of sorrow on the death of Harry L. Horning, late president of Waukesha Motor Co., were offered Mr. Horning's family and his company by the board of directors of the Automobile Parts and Equipment Manufacturers, Inc., and the Council of the Society of Automotive Engineers, both of which met on Friday, Jan. 17. In the case of the S.A.E. resolution, David Beecroft, of Bendix, and S.A.E. treasurer, was designated to prepare the formal document.

Skinner Urges APEM Members Not to Exceed 48-Hour Week

At the second annual meeting of Automotive Parts and Equipment Manufacturers, Inc., held in Detroit, this week, the following were elected as officers of the Association for 1936: C. C. Carlton, secretary of Motor

Wheel Corp., Lansing, Mich., as president; Ben F. Hopkins, president of the Cleveland Graphite Bronze Co. of Cleveland, Ohio, as vice-president; M. C. Dewitt, vice-president of Champion Spark Plug Co., Toledo, Ohio, as secretary, and D. W. Rodger, vice-president of Federal-Mogul Corp., Detroit, as treasurer.

The meeting was attended by 195 representative members of the parts industry and was addressed by C. C. Carlton, president; C. O. Skinner, executive secretary, and Dr. Neil Carothers, head of the College of Business Administration of Lehigh University.

Mr. Skinner urged that the members of the parts industry, to prevent further legislation, do not exceed the maximum of 48 hours per week and that the hourly rate be not reduced. He stated that employment reached 180,562 during 1934, and in 1935 reached the peak of 185,648. Comparing the first ten months of 1935 with the first ten months of 1934, employ-

Little Shots of Big Shots—

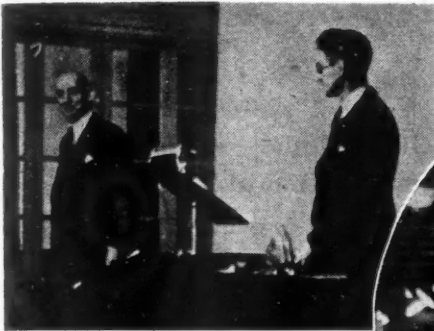
Here and there the camera wended its way through the crowd for these intimate pot-shots of the Annual S.A.E. Meeting

Automotive Industries is indebted to Hector Rabezzana and Charles R. Whittelsey, Jr., for these candid camera studies.



Bob Combs, Prest-O-Lite Co. of Canada waits under the marquee

Dr. William F. Durand, receiver of the Guggenheim Medal



Dr. H. C. Dickinson received life membership. W. B. Stout presided



The engineering exhibit was the one central point of interest



"Piston Friction" was the subject of M. P. Taylor's talk at which James H. Herron presided



Fred M. Zeder (left) gets confidential with B. E. Hutchinson



It's funny. Roscoe Turner (left) and John A. C. Warner got it



Peter Altman, chairman of the Detroit Section S.A.E.

Herbert L. Sharlock, director of advertising, Bendix Aviation Corp.

(Left), A. L. Beall, Wright Aero, Col. H. W. Alden of Timken and S.A.E. president, Ralph Teetor

(Right), Herbert Chase on the "Car of the Future" with Karl Wise presiding



(Left), Col. J. G. Vincent and Dr. Dickinson, past presidents of the S.A.E.

(Right), Bendix Trophy winners, Benny Howard (left) and Roscoe Turner



Used-Car Plan Factory Banned

(Continued from page 105)

petitive disadvantage with any who did not adopt the plan. If it is to be tried out at all, there must be concerted action on the part of the manufacturers, in which event the program would inevitably founder on the rock of illegality. Concerted action would raise promptly the charge of combination in restraint of trade. However, factory legal departments so far have given little thought to the details of the plan, but expressed the offhand opinion that anything that looked like an agreement among manufacturers to put the program into effect would have an unlawful complexion.

No one, it was held, would be likely to take issue with the individual manufacturer's right to exercise control of his own dealers by means of the cancellation penalty, but the legality phase of the question, so far as individual action is concerned, has no significance if no company has faith in the plan nor is willing to risk its future on so hazardous a step.

On the whole, factories take about the same position on the new scheme for solving dealers' troubles with their used car business as they did on the

N.R.A. plan. Factories could not be prevailed on to agree to enforcement of the former plan and are just as unlikely to accept any substitute enforcement measure in the present plan which would place the burden on them.

Manufacturers have no faith in panaceas for solving the used car problem. They point to the failure of all previous plans of coercion, even that involving governmental enforcement. Factories feel that they may lend valuable assistance with promotional plans and advertising, but to ask them to police the dealers is another matter.

Ford Products Advertised For Use on Other Cars

Through consumer advertising released this week, the Ford Motor Co. brings to the attention of the public for the first time the possibility of using Ford products on other makes of cars. Batteries under the Ford trademark are offered in several sizes. Attention is drawn to the quality of the batteries and to the advantages of genuine Ford parts, but nowhere is the appeal directly to Ford owners. This is understood to represent no change of policy on the part of the company except in so far as its advertising is concerned.

Pontiac Pays Dealers \$20 per Car Junked

Pontiac Motor Co. is cooperating with its dealers in a nationwide used car junking plan which it is expected will put off the highways permanently some 10,000 hazardous vehicles, according to A. W. L. Gilpin, vice-president and general sales manager. Pontiac will pay its dealers \$20 for the cars they scrap during January and February under the terms of the plan.

"All junking, which will be under the supervision of our district managers, will be complete in every respect," said Mr. Gilpin, "so there is no chance these cars will ever run again. Preliminary reports indicate that dealers are taking hold of the plan even more enthusiastically than we anticipated."

Glen J. Bundy to Manage Owen-Dyneto at Syracuse

Glen J. Bundy, sales engineer of Electric Auto-Lite Co., and former production manager of USL Battery Corp., has been named vice-president and general manager of the Owen-Dyneto Corp., subsidiary of Auto-Lite at Syracuse, N. Y., it was announced by Royce G. Martin, president.

130,000 Items—Good For a Year

Presenting facts in the most compact form consistent with readability, the 1936 Statistical Issue of **AUTOMOTIVE INDUSTRIES** will be issued on Feb. 22. In addition to its scores of departments of time-proved interest, the 1936 issue will contain many new statistical features of value to engineering and merchandising executives of the automotive industry.

AUTOMOTIVE INDUSTRIES and Chilton Co., publishers of the magazine, take pride in the completeness, accuracy, and authenticity of the information contained in the Statistical Issue, made possible by thousands of man-hours of work in the company's statistical department, plus the active cooperation of every available source of information.

Among the new features of this year's issue is a table picturing production, payroll and employment indices. Other tables show important data on the buying habits of different types of automotive retail outlets, showing, for instance, the proportion of purchases which go through the different channels of distribution. Pertinent facts on wholesaling practices are included.

World and U. S. registrations are given by country, by state, and by year, and include passenger cars, trucks, buses, tractors, airplanes and motor boats. World and U. S. production is

shown by countries, and U. S. production by make, months, body types, number of cylinders, price groups, and wholesale value. New car and truck sales are covered by every conceivable breakdown, including sales by states, by makes, by dollar volume in retail price class, and by dealers.

A feature originated last year shows the latest available count of all wholesale and retail outlets, including dealer representation by make throughout the country.

Engine trends is the subject of another section devoted to an analytical breakdown of important engine statistics. This covers a 14-year period, and shows average compression ratios, average hp. per cu. in. of displacement, the trend in timing drives, in piston design and valve location, as well as a large number of other useful tables.

High-spot automotive statistics include gasoline consumption and taxes, complete export and import data pertaining to the industry, new and used car financing, number of vehicles scrapped per year over a period of 12 years, tire production by types, and similar data.

Specifications will be published under 661 separate heads, and will include full details of American passenger cars, trucks, buses, airplanes, tractors and outboard motors as well as all foreign passenger cars, airplane and diesel

engines. Every American stock engine, gasoline or diesel, will be represented, as well as the specifications of all standard stock items such as gearsets, clutches, front axles, rear axles, steering gears, etc.

The motor vehicle departments of every state, the United States Department of Commerce, and virtually all automotive manufacturing associations have assisted in the compilation of facts. Every U. S. manufacturer of passenger cars, trucks, buses and tractors, has contributed to its pages, as well as the makers of airplane, Diesel, stock and marine engines and outboard motors, and the makers of stock units such as gearsets, clutches, front and rear axles, etc.

Marcus Ainsworth, chief staff statistician, is in charge of gathering and presenting the facts. An idea of the scope of the work involved may be gained by an inside view of the tables on U. S. and world registrations. As figures are received from every state in the country, as well as the District of Columbia, all are carefully checked. Non-residents, for example, must be deducted; tax free vehicles of the state must be added; everything is done to assure the highest accuracy possible. To get world registrations, reports from consular offices, trade associations and foreign correspondents from every important nation must be tabulated.

Ford to Show at Texas Centennial Exposition

Ford Motor Co. plans to erect its own exhibit building at the Texas Centennial Central Exposition, to be held in Dallas from June 6 to Nov. 29, to commemorate the state's progress since it won independence from Mexico 100 years ago.

The Ford building will be of steel, concrete and sheet-rock, and will have a floor space of 55,000 sq. ft., of which about 40,000 sq. ft. will be devoted to exhibits. It will face the Court of Honor and will be opposite the Federal Building. The other side of the building will open onto a lagoon around which the Fine Arts building, the Museum of Natural History and an amphitheater will be placed.

Chief feature of the Ford exhibit will be displays showing the use of raw material from the Southwest in the manufacture of Ford products.

Special GM Showings Will Start Next Week

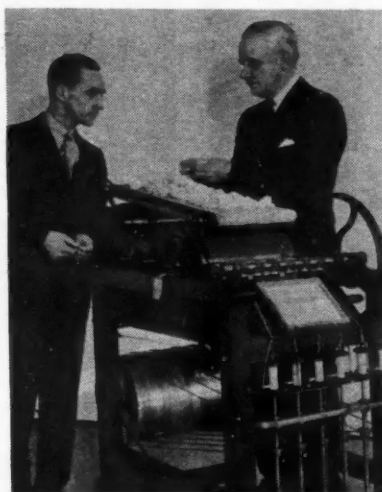
General Motors will hold its 1936 special showings of motor cars, automotive and household products, earlier than usual this year, Alfred P. Sloan, Jr., president, announced today, due to the early introduction of new models in November of last year. These showings are usually held from two to three months after the national automobile show previously held early in January at New York.

The shows, to be held in the principal exhibition halls of 45 cities on varying dates this year, will start Feb. 1 and will be concluded May 2, the majority of shows lasting a week as in the past. The majority of the earlier showings will be held in the south, while the later showings will be held in the north to coincide with the coming of spring.

Featuring the exhibits will be the latest models of General Motors cars, showing the current advances in engineering and style, with special reference to Fisher Body turret top, all-steel bodies, no-draft ventilation and streamlined styling, in addition to knee action wheels, hydraulic brakes and a host of other mechanical features. In the household appliance field, electric refrigeration, air conditioning, water coolers, electric fans and irons, oil burners, light plants and pumps, and other appliances will be shown.

Structural work will be completed and installation of equipment will begin within the next week in the new Michigan Tool Co. plant on Six Mile Road, Detroit, according to Otto Lundell, president. Contracts have already been let for the extensive new machine tool and other factory equipment for the new plant.

Manufacture of head-lamps and bumpers is expected to be begun within one month by the General Motors Corp. in its Brown-Lipe-Chapin division plant at Syracuse, discussed since 1932. According to official announcement, operations of the company elsewhere will not be affected by the development.



Edsel Ford (left), president of the Ford Motor Co., and Nathan Adams, chairman of the board of directors of the Texas Centennial Exposition, examine the 100-year-old plantation cotton-spinning machine which will form part of the Ford exhibit at the Exposition

Will "All Three" Compete On Low Monthly Payments?

(Continued from page 105)

the contest between the volume producers.

Ford took the lead with widespread advertising of the \$25 monthly payment plan. Plymouth, with less fanfare, is matching these terms, announcement being made this week in connection with its regular product advertising. Chevrolet, which is still to be heard from, is understood to be supplying dealers through the G.M.A.C. with 24-month charts permitting dealers to take advantage of the longer term as they see fit.

Hudson-Terraplane

Retail sales of Hudson and Terraplane cars in the U. S. during December totaled 8879 cars, a gain of 39 per cent over preceding month and 211 per cent over corresponding month of last year, according to William R. Tracy, vice-president in charge of sales.

The December figure brings the Hudson-Terraplane retail sales in the United States for the full year 1935 to 78,745, a gain of 26 per cent over the 1934 total, greater than for any year since 1930.

Chevrolet

Chevrolet retail sales in the first 10 days of January nearly paralleled those for the same period last month, and established an all-time record for the first reporting period in January. New car and truck sales reported by Chevrolet dealers totaled 23,966, a 215 per cent increase over corresponding figure for 1935, and used car sales of 34,370 units were up 75 per cent. "The closest approach, in new car sales, was in January, 1930, but it was 9000 units under the January, 1936, record. In used car sales, the best previous first 10 days in January was in 1931, and it was 14,000 units under the figure just achieved," said W. E. Holler, vice-president and general sales manager.

The Toledo furnace plant of Interlake Iron Co. is expending \$100,000 for equipment and plant facilities to make iron paving blocks.

Output Rate Based On Car Stock Level

(Continued from page 105)

tinue on the upward trend, although at a much retarded rate, for at least another two months. By that time they easily will have reached a new all time high. It is estimated that used car stocks already are closely approaching the 1929 peak of 600,000 units, despite the fact that through special promotional effort sales are currently running about 50 per cent higher than a year ago.

New car sales which have suffered from the effects of severe weather conditions, the lull that followed the pre-holiday activity, and the glutted used-car market, have nevertheless held up surprisingly well. Evidence of an upturn is seen by sales executives of some companies based on the latest reports from the field. All are confident that an appreciable stimulus will come from the payment of the veterans' bonus which should be felt particularly in the used-car market.

Steel Made Stainless by Chromium Alloy Plating

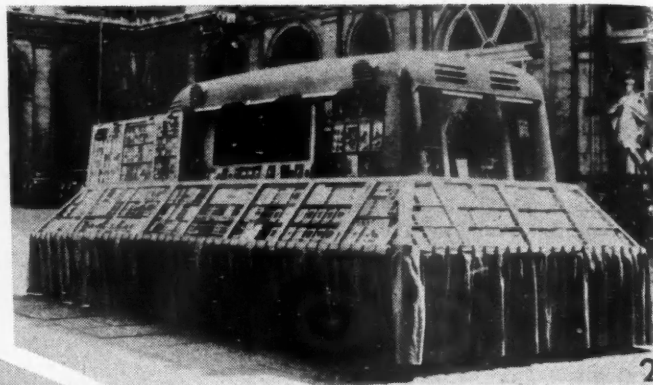
A new process for the manufacture of "stainless" steel sheets and strips has been announced by Cooper Products, Inc., of Cleveland. It consists in forming a coating of chromium alloy on steel bars in such a way that they can be rolled down into sheets or other shapes without removing the surface material. The product thus obtained is expected to show the same advantages as regular stainless steel, which in fabricated form costs from 16 to 35 cents a pound. It is believed that under the new process of Cooper, soft steel may be "chromized" at a cost of not more than 4 cents a pound.

Cadillac Gives Diplomas to 2000 Service Graduates

The unique Cadillac Certified Craftsman's League is celebrating its first birthday anniversary. Observance will include presentation of diplomas to more than 2000 Cadillac-LaSalle service specialists, "the class of '35," who recently completed a rigorous 12-month course of service study. The league was founded by Nicholas Dreystadt, general manager of the Cadillac Motor Car Co.

Klingler Will Address Detroit Traffic Club

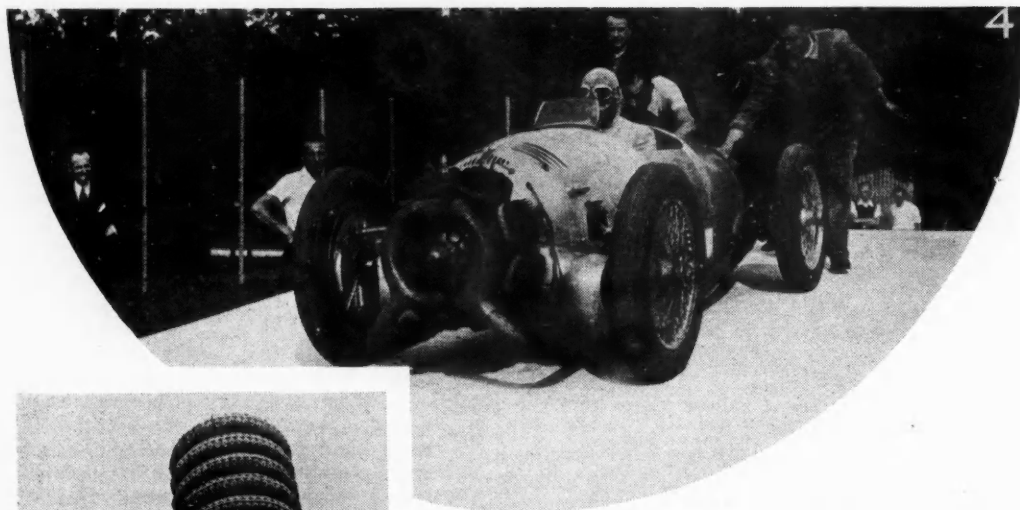
H. J. Klingler, president and general manager of Pontiac Motor Co., will deliver the principal address at the banquet of the Traffic Club of Detroit at the Book-Cadillac Hotel Tuesday, Jan. 28. Between 800 and 900 railroad men and traffic managers will attend the banquet, and at the speakers' table will be 24 presidents, chairmen of boards, and operating vice-presidents of leading railroads.



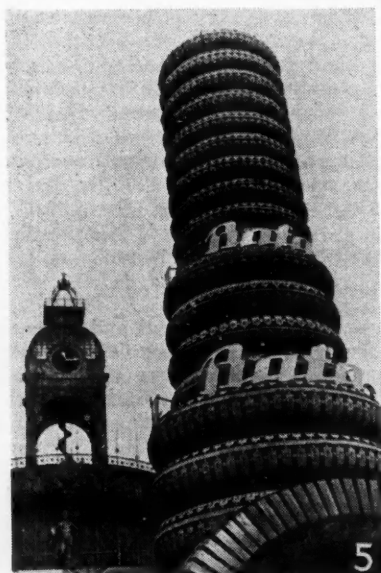
1 and 2. Two views of an auto library in use in Spain. The library on wheels also carries a miniature radio broadcasting station and motion pictures for the entertainment of the public. The two views show it ready for the road and ready for service

3. One of the three-wheeled delivery trucks introduced in the Post Office department on January 1, 1913

The WORLD on WHEELS



4. Count Trossi's radial-engined car for which 250 hp. is claimed, with a speed of 155 miles per hour



5. A tower of tires, an advertisement at the Prague Fair for a well known tire manufacturer in Czechoslovakia

6. A gyro without wings is the latest in aircraft. The propellers not only act to sustain the craft but also to propel it

M.I.T. Begins Study of Two-Cycle Air Engines

A research program on aircraft engines has been started by the Massachusetts Institute of Technology to extend general knowledge on the subject. Two problems are being studied in particular, viz., the adaptation of the two-cycle engine to aircraft use, and the dynamic characteristics of the induction systems of conventional internal-combustion engines. The studies are being conducted in the automotive engine laboratory of M.I.T., aided by funds from the National Advisory Committee for Aeronautics.

Designing a two-cycle engine presents much greater difficulties than the conventional four-cycle type, and partly for this reason this type engine has not been extensively used in aircraft. The inherent disadvantage of the two-cycle engine is that burned gases cannot be forced out of the cylinder on the return stroke of the piston, as is done in the four-cycle engine, but must be displaced by the incoming gases with a minimum mixing of the burned and fresh charges, and a minimum loss of the new charge from the exhaust valve. It is this scavenging problem that is to be studied in particular.

The M.I.T. laboratory is considered especially fitted to make this study because of work previously done on direct fuel injection, and because of the availability of the new M.I.T. indicator for determining the charge in the cylinder. Direct fuel injection, similar to that of the Diesel engine, is expected to go far toward solving the problem of fuel consumption and control in the two-cycle engine.

The second investigation will be a study of the so-called ramming effect in the inlet of an engine. Air, after it is once set in motion, tends to continue to flow, and because of this property it is possible, without supercharging, to fill the cylinders of an engine with air at a pressure higher than atmospheric, and thereby increase the output. The M.I.T. engine laboratory has been at work on these problems for some time, and the results of its investigations are already having an influence on modern aircraft design.

Road-Builders Cheered by Billion-Dollar Highway Fund

The highway industry opened its "Recovery Road Show" in Cleveland last Monday with a display in Exhibition Hall of 360 car-loads of road scrapers, steam rollers, conveyors, steam shovels and high-speed dirt hauling units. The show and convention, from Jan. 20 to Jan. 24, is the first time the industry has had a chance to express itself since the low tide of 1933 when the American Road Builders Association held its last thorough-going road show.

The association has estimated that a billion dollars are assured for highway construction during 1936, and ex-

pected 20,000 road builders in Cleveland to view the displays of 195 exhibitors. Delegates represented every manufacturing and production point in the U. S. and Canada, Mexico, Cuba, Russia, England, South Africa and other foreign countries.

Sales of American-made equipment were expected to set a new record for years.

At the opening of the road show, engineers led by the Cleveland Engineering Society deplored the fact that out of the billion dollars to be spent for highway construction this year only 75 per cent will be spent under the contract system. The Society declared the trend is away from the contract system and should be checked and reversed. It said engineers, manufacturers, contractors and producers will pay a severe penalty if the "force account," or day-labor, method of constructing highways gains ground.

Charles M. Upham is director of the 1936 road show. He predicted the show and convention will break all records. One giant shovel weighing 130,000 pounds is 20 tons heavier than any unit ever before displayed at a road show. Thomas H. MacDonald, chief of the Bureau of Public Roads, U. S. Department of Agriculture, was one of the principal convention speakers.

GM's Overseas Sales Back to 1929 Level

Overseas sales of General Motors cars and trucks, from all sources, totaled 25,998 units in the month of December, representing a gain of 14.3 per cent over November, and a gain of 58.3 per cent over December, 1934. The figure is the highest for the month of December ever recorded.

For the complete year 1935, General Motors overseas volume totaled 284,281 units, an increase of 28.9 per cent over the 220,560 sold in 1934. The 1935 volume marks a full return to the levels prevailing in the peak years of 1928 and 1929.

Burlington RR. Orders Two Ten-Car Trains from Budd

An order for two ten-car, lightweight, stainless-steel trains, designed for overnight operation between Chicago and Denver, has been placed with the Edward G. Budd Manufacturing Co. by the Chicago, Burlington and Quincy Railroad. Construction will begin as soon as engineering plans are completed. The trains are scheduled for delivery in June.

This order, which calls for more stainless-steel cars than have been built all told in the five streamlined trains produced by the Budd company, will give employment to several hundred men during the first half of the year, Edward G. Budd, president of the company, said. The trains, to be known as the "Denver Zephyrs," will include sleeping cars, compartment cars, parlor cars, de luxe coaches with reclining chairs, lounges, diners and observation cars. Except for their length, the trains will be similar in exterior appearance to the streamlined Zephyr trains that are now in service on the Burlington.

The tentative schedule calls for a sixteen-hour run between Chicago and Denver, 1039 miles, compared with the present running time of 27 hours, 45 minutes. Passengers will leave Chicago late in the afternoon and arrive in Denver before breakfast the following morning, thus saving a business day.

Pontiac Names Three to Head Sales Divisions

Three important appointments in the central office personnel of Pontiac Motor Co. are announced by A. W. L. Gilpin, vice-president and general sales manager. F. H. Fenn has been named manager of sales promotion and group selling; W. I. Gibson, assistant to both the general manager and the general sales manager, and E. R. Pettingill, car distributor.

CALENDAR OF COMING EVENTS

SHOWS

Amsterdam, Netherlands, Automobile Show	Jan. 31-Feb. 9
Germany, Automobile Salon, Berlin	Feb. 15-March 1
Finland, Automobile Show, Helsinki	Feb. 25-March 1
Austria, Automobile Show, Vienna	March 8-15
Switzerland, Automobile Show, Geneva	March 20-29
Hungary, Automobile Show, Budapest	Mar.-April
Illinois Automotive Parts Assoc., Maintenance Exhibit, Navy Pier, Chicago	April 4-8
Portugal, Automobile Show, Lisbon	begins April 16
Yugoslavia, Automobile Show, Zagreb	May 2-11
Spain, Automobile Show, Madrid	May 10-20

France, Automobile Exhibit at Foire de Paris	.....May
Norway, Automobile Show, Oslo	.....May

CONVENTIONS AND MEETINGS

Assn. Highway Officials of No. Atlantic States, Atlantic City	.....Feb. 12-14
American Society for Testing Materials, Regional Meeting, Pittsburgh	March 4
S.A.E. Tractor and Industrial Power Meeting, Milwaukee, Wis.	April 15-16
S.A.E. Production Meeting, Detroit, Mich.	.....April 21-24
U. S. Chamber of Commerce, Annual Meeting, Washington	.....April 27-30
American Petroleum Institute Mid-Year Meeting, Tulsa, Okla.	May 13-15
S.A.E. Summer Meeting, White Sulphur Springs, W. Va.	.....May 31-June 6
American Society for Testing Materials, Annual Meeting, Atlantic City	June 29-July 3

Diesels and Converted Gasoline

By C. LINCOLN CHRISTENSEN

SPEAKING on the general topic of speed on the water, instead of "Speed in Industry," as had been announced, Garfield A. Wood addressed the Metropolitan Section of the S.A.E. at their annual Motorboat Show Meeting on Jan. 20.

Declaring that he lost interest in a completed experiment, and that he was primarily interested in experimenting along new lines, the speaker went on to explain the difficult problems which had to be overcome in building the racers which brought the Harmsworth Trophy and the world's water speed record to America.

The four Packard motors which drove the ten-ton Miss America X at almost 125 miles per hour were originally rated at less than 800 hp. each, but after intensive development their output was increased to almost 2000 hp. Supercharging to an intake pressure of about 10 lb. resulted in mixture heating troubles, with manifold temperatures running up to 190 degrees. Reducing the mixture temperature to below atmospheric temperature increased the power output of each engine by one hundred horsepower, and was accomplished principally through the addition to the fuel of alcohol, which absorbs considerable heat when vaporizing. The composition of the fuel used was: one-third alcohol, one-third benzol, and one-third 80-octane gasoline.

Citing several cases where mechanical failures predicted on the basis of mathematical calculations failed to oc-

cur in practice, Mr. Wood closed by saying he did not use the pencil in development work, but used the book of experience.

David Beecroft, chairman, next introduced Charles P. Burgess, who spoke on the importance and influence of aeronautics in many fields, instead of reading his prepared address on "Aeronautics in Naval Architecture." To prove the load-carrying efficiency of the lighter-than-air ship, he quoted figures giving the ton-miles per gallon of fuel used by different carriers. Miss America X, traveling at top speed, was rated at two ton-miles per gallon, the China Clipper at 15, a naval destroyer at 15, while an airship of the Graf Zeppelin type topped the list with a rating of 90 ton-miles per gallon.

The speaker went on to say that the application of aeronautics was largely responsible for the rapid progress that had been made during the past twenty years in racing sailboat design. He also emphasized the importance of streamlining at low boat speeds, and stated his belief that streamlining the cabins and upper structure of motor boats would result in a more economical and possibly in a more seaworthy boat.

At the 31st National Motor Boat Show the movement toward greater use of diesel engines in marine service was evident from the number of new diesel engines introduced this year. Judging from the models offered, the trend in gasoline power units seems to be still in the direction of the light high-speed automotive type, and several gasoline engines have been developed for in-board installation with about the same power output as the largest outboard

engines. The widespread use of rubber engine mountings, in combination with the highly developed, smooth-running engines, has made possible a greater degree of comfort in motorboat operation than ever before.

Among the automotive engines shown were the Graham supercharged engine converted for marine service, as well as several conversions of the Ford V-8.

A fuel oil burning conversion of the four-cylinder Ford motor was introduced by the Palmer Co. Started by gasoline, it runs on fuel oil after the exhaust-heated vaporizer has been sufficiently warmed. A rotary valve charge distributor operated from the distributor drive shaft above the cylinder head admits air to the intake manifold during the first part of the admission stroke, resulting in a lean mixture of about 20 to 1 ratio. After the distributor valve has closed during the latter part of the intake stroke, a richer mixture with a ratio of about 10 to 1 is drawn through the carburetor. It is claimed that this method of charge stratification has greatly reduced crankcase dilution.

The Bendix Co. exhibited their line of marine accessories, which included inertia starters for diesel engines, and control and navigating instruments. Their newest product is a two-cycle 19½-lb. outboard motor which develops between 1½ and 2 hp. at 3750 r.p.m. It is air cooled by the flywheel fan, which forces 450 cu. ft. of air per minute over the engine. All parts of the unit are of aluminum alloy, excepting the crankshaft, connecting rod, gears, monel metal drive shaft and the Ni-Resist cylinder sleeves. Another new Bendix product is a storage battery

Engines Featured at Motor Boat Show

**Gar Wood develops anew his 2000 hp. engines for Metropolitan Section S.A.E.
Charles Burgess fosters aeronautical principles for marine design.**

driven outboard, with the propeller direct connected to the electric motor, the entire unit being submerged.

Three sizes of the Waukesha Comet diesel, converted for marine use, were shown by the Red Wing Motor Co. The Comet combustion chamber developed by Ricardo is formed in removable inserts, which may be changed to vary the compression ratio. Though commonly termed a precombustion chamber type engine, this is not an entirely accurate description, as all the fuel is burned in the chamber, which, it is claimed, tends to protect the piston and cylinder walls.

Buda has incorporated the Lanova diesel combustion principle on all but the largest and the smallest diesel engines in their marine power units. In this design the fuel is sprayed horizontally across the main combustion chamber into the air chamber where combustion begins. Discharging with high velocity from the air chamber, the combustion proceeds, carrying the remaining fuel which is in suspension in the main chamber, and setting up a turbulence which thoroughly mixes the atomized fuel with the air. Controlling combustion in this manner, by accelerating the end of the combustion cycle, has produced B.M.E.P.'s of slightly over 100 lb., in a 275 cu. in. engine, with a compression ratio of $12\frac{1}{2}$ to 1, and a maximum pressure of 625 lb. Cold starting has been made positive by using battery-heated glow plugs.

The Fairbanks-Morse Co. manufac-

tures diesels in two cylinder sizes, combined in units of from one to eight cylinders, with a power range from 10 to 160 hp. A feature of this engine is a three-piece connecting rod which permits the insertion or removal of shims between the main body of the rod and the crankpin bearing to vary the compression ratio for different operating conditions and different fuels.

A characteristic of the Hill two-cycle opposed piston balanced diesel is that the piston side thrusts are reduced because the short connecting link to the connecting rod rocker arm does not move through as great an angle as the conventional connecting rod. Since the reciprocating masses move in opposite directions at the same rate of speed at all times, vibration has been greatly reduced in this engine.

A two-cylinder, horizontal opposed, four-cycle high-speed diesel engine was demonstrated by the Covic Diesel Engine Co. This engine has been manufactured and operated abroad, where it is known as the Victor Cub Diesel. With a bore and stroke of $3\frac{9}{64}$ by $3\frac{15}{16}$, it develops 15 to 18 hp., and has a speed range of 500 to 3500 r.p.m. A starting crank geared to half engine speed, together with a quick release decompressor device facilitates cold starting. An unusual feature of this engine is the soft cast iron cylinder liner used, which has been found to give better service than the harder cast irons.

Diesels have been extensively used in marine service where cost of operation

has been an important factor, but they have not found as wide an application in pleasure craft. Now, however, the diesel promises to become more and more important as a marine power unit in all size boats, as engine costs have been lowered, the proper fuels are more easily procured, and the mystery concerning maintenance is being dispelled by the realization that, excepting for the injector and fuel pump, a diesel may be serviced the same as a gasoline engine. Another point in favor of the diesel for marine service is the reduced fire hazard when carrying diesel fuel.

The Horizons of Business

By Joseph Stagg Lawrence

The Budget

IF circumstances can be animated by spite there is little question but that they visited upon the President of the United States the full measure of their vindictive emphasis. We speak of the budget and the message on that subject which the chief executive sent to Congress. With business well on the road to recovery and a bitter political campaign in prospect, it is not surprising that the fiscal condition of the Federal government should be presented in the most favorable possible light consistent with the facts.

The budget message, it may be recalled, indicated a deficit for the fiscal year 1936-1937 of \$1,098,000,000. This figure affords gratifying comparison with the deficits of the three preceding years, \$3,989,000,000 in 1933-1934, \$3,575,000,000 in 1934-1935 and \$3,234,000,000 in 1935-1936.

This Contrast

This contrast made the headlines and conveyed to the great bulk of citizens who never read beyond them—since they dealt with such unsensational and dramatically sterile material as the finances of the Federal government—the impression that the government is conquering the “emergency” as rapidly as business is vanquishing the depression. The headlines implied an improvement of more than two billion in the budget as compared with the preceding year. Suspicious and cynical critics averred that the budget message was deliberately designed to exploit anticipated publicity and the mental fatigue of the public. The pursuit of the budget presentation beyond the flaring headlines is an intellectually excruciating ordeal to the average citizen.

Qualifications

The headlines omitted certain vital qualifications. The first and most important was the inability of the President to estimate the amount which would be required for relief during the coming fiscal year. The precise amount obviously would depend upon the extent to which “industry would re-em-

ploy the idle.” The administration apparently wishes to give business every opportunity to reduce the relief burden of the government to a minimum before it appeals to Congress for the necessary funds. Again a jaundiced opposition holds as curious the coincidence of this solicitude and a campaign year. The disposition to give the government the benefit of such doubts has completely evaporated during the past year.

The Three Branches

In addition to the diminishing charity and benevolence of the opposition the government has been embarrassed by other developments. While one branch was preparing estimates of Federal revenue and expenditures for the President, another branch, the Senate Finance Committee, was inviting Secretary Morgenthau of the Treasury to show cause why the bonus should not be paid. Still another branch, the Supreme Court, was declaring unconstitutional one of the major pillars of the New Deal and invalidating hundreds of millions in taxes and to be paid. It is this “concatenation of adverse circumstances” which seems inspired with malice.

The AAA had already collected approximately a billion dollars in processing taxes. About \$200 million had been paid under protest and were held in escrow. Present probabilities are that the government will lose the latter and may be liable for the former, although its recovery by processors is highly doubtful. The Treasury had been counting on about \$600 million per year in processing taxes. This revenue would have enabled the government to fulfill its contracts with the farmer. Now the revenue is denied while the liability remains, if not legally, at least politically. There is no question but that the government will make good its agreements with more than three million farmers. This unpleasant information came to the government at the very time that the President's budget message was being read to Congress.

A Dilemma

We return now to Mr. Morgenthau and the Senate Finance Committee. The lobby gadflies of the bonus boys

had pressed the legislators to a point where they were desperately eager to settle the issue. The President has been consistently opposed to the bonus and a Secretary of the Treasury with three successive deficits exceeding three billion dollars each must necessarily feel the same way about it. The point is that the interest of the finance minister demanded the most alarming portrait of the government's finances. Many ingenuous citizens reading a statement by the Secretary of the Treasury designed to dissuade a group of senators from reporting the bonus bill favorably would find it difficult to reconcile its alarming portents with the assuring message on precisely the same subject which the government had presented to Congress a few days before. Mr. Morgenthau begged the senators to hold his revelations in confidence. To some members of the committee such an agreement was incompatible with their duty to the public and as a result we now have the Secretary's picture of the budget.

A Corrected Account

This makes unpleasant reading. He estimates relief expenditures at two billion. Since the deficit ex relief was a billion, this at once returns the deficit to the company of previous fiscal years. There are two other items. The bonus will probably be passed, a presidential veto notwithstanding, and this will raise the deficit to five billion. To fulfill contracts with the farmers will require not less than \$300 million and possibly as much as \$600 million. Instead of a deficit of a billion for the fiscal year 1936-1937 the Treasury faces one of five to six billion. This will raise the national debt to \$36 billion. Giving effect to recoverable assets such as RFC loans which the Treasury believes may be as high as \$4 billion, we shall have a net debt of \$32 billion by June 30, 1937.

The Real Cause of Alarm

In spite of the apprehensions expressed by Mr. Morgenthau regarding the government's credit and the effect which the passage of the bonus may have, the bonus itself and the present
(Turn to page 134, please)

JUST AMONG OURSELVES

Eyes Right to Used Cars

USED CARS — NO DOWN PAYMENT — FREE INSURANCE — NO INTEREST.

Signs like that are springing up all over Detroit. Nowhere yet have we seen a sign, "Used Cars Given Away," but we await it with certainty if only as a catch-poll slogan with fishhooks invisible.

From the meeting in New Orleans last week of the National Automobile Dealers' Association came a plan to cut losses on used-car trading. Under the plan, factories would be petitioned to insert in dealer contracts clauses making contracts subject to cancellation if dealer failed to show gross profit of 20 per cent on his used-car trading for a designated period.

No pious acclamation from sales executives greeted the plan. Our Detroit office pretty well sprinkled factories in the region with inquiries about the plan one afternoon this week. Two things were apparent: Many of the industry's top-flight sales executives are on the road trying to help to get used cars moving—profit on them for the moment is a secondary consideration. Executives reached were almost unanimously willing to doubt vociferously that the plan would work.

One executive we talked to took a half an hour of straight conversation to amplify his reason for thinking the plan was—unprintable word.

Unusual celerity in announcing definite advertising and merchandising plans to help dealers move used cars distinguishes factory efforts in this direction.

The situation is complicated unquestionably by emphasis on low-cost-per-month financing—but may be improved as payments are made under the service certificates of World War veterans. During the next few months the used car will be glorified to the public under factory auspices as never before. And what then?

Dillon

IN Detroit this week we went to see F. J. Dillon who, so far as the American Federation of Labor is concerned, is its representative in the automobile manufacturing industry, but who falls far short, as things stand, of being the spokesman for all the factions of labor in the industry.

Dillon's importance, as we see it, is something like that of a rock in a whirlpool—he serves to give definition to the swirling currents of agitation which have flowed over the industry since the NRA was born.

Men who deal with men are strangely alike, no matter on which side of the fence you find them. Talking to Dillon, one is reminded of the works managers in half a dozen plants which might be named. There is the same air of solidity, of gray competence, of soft but positive assertion, of talking a man's language to men.

Among unionists, Dillon belongs to the conservative Gompers school, with an innate belief in the virtues of trade unionism, but above all, a belief in the effectiveness of collective bargaining for labor, no matter what form the collectivism may take. There are almost as many alphabetical factions in the labor

ranks in Detroit as there are alphabetical agencies remaining in Washington. Dillon is inclined to minimize this, in spite of its importance in union politics.

Dillon is bitter about the number of private "detective" agencies in Detroit. One or two strikes of recent prominence, he says willingly, may be traced to these agencies placing operatives in plants for the sole purpose of stirring up trouble and thus making their "services" necessary to management. He is willing to think, too, that management has brought such troubles on itself by haste to listen to such harpies who come with confidential information about labor conditions to sell.

There's no communism in Dillon, although he's willing to use the word as a scarecrow to those who oppose fundamentally the program of organized labor.

And what is the program? Uppermost in Dillon's mind is the efficacy of the 30-hour labor law as a means of unemployment absorption by industry. He professes to believe that permanent prosperity can be founded on such a measure, and that nearly all the unemployed can be drawn into industry by its means. Shorter hours—higher wages. These are matters within the understanding of the man who works—and Dillon will make the most of them.

Coughlin

IT is no new thing for a priest to become an important figure in social struggle.

There is plenty of historical precedent, but as times change so do the things which they may contribute to a cause. Father Coughlin, in a thumbnail interview for which we made the "pilgrimage" to Royal Oak, now famous suburb of Detroit, was a little too willing to emphasize that his connection with the independent unions in the automobile industry was not of his direct seeking. According to his

(Turn to page 129, please)



S.A.E. Annual-Meeting

Questionnaires and Speed Critics

THE customer-research activities of General Motors have built up a list of about 80,000 "motoring enthusiasts" who, although they are not qualified to pass on engineering details of new cars, in their opinions as to the utility of such details are about 18 months in advance of the thinking of the average motorist who replies to questionnaires on similar subjects. This point was made by H. G. Weaver, director of the customer-research division of General Motors, who emphasized in a talk of the "Customer's Point of View" the value to automobile manufacturers to be obtained by a consistent attempt to find out what it is.

Mr. Weaver's address was given at a session on traffic safety, at which the second speaker was Dr. Miller McClintock, director of the Harvard Bureau of Street Traffic Research, of which the activities are supported by the Automobile Manufacturers Association.

One mistake of general character in consumer advertising of automobiles, Mr. Weaver holds, is to make comparisons between the current year's model and that of the year just past. The worst sales prospect in the world, he points out, is the man who owns a car a year or less in age. It would be more to the point, Mr. Weaver believes, to make mechanical comparisons in advertising with cars which are several years old, and of which the prospect may not have realized the disadvantages as compared with the 1936 models.

Questionnaires, it was stated, can be

made extremely effective in customer-research work. There are no signposts for the questionnaire writer, however, and Mr. Weaver mentioned that it was necessary to search the world of business literature before an adequate guide could be found in preparing questions so answers to them would be of the character wanted. He found his mentor finally in an old set of English law books—"Chamberlain's Guide on Examination and Evidence."

So far as getting people to answer questionnaires sent by mail, Mr. Weaver said, a "low-pressure" approach is often better than any amount of sales talk. On one lot of questionnaires sent out by his office, in a covering letter it was stated that they were simply sent out as a matter of information. An equal batch of the same questionnaire was sent out with a letter requesting immediate attention to this important activity of the General Motors Corp., etc.

Replies to the first group, to which no reply was asked, far outnumbered replies to the second group, although the letter accompanying the second group had been concocted with all the art possible to getting a direct answer.

THE importance of basic education in the reduction of traffic accidents was emphasized by Dr. McClintock, who introduced, from an analysis of the highway factors contributing to traffic hazards, a new concept, that of the "limited way." The latter is a highway

so constructed that there is a complete physical separation of opposed streams of traffic, the lanes of which are reserved exclusively for traffic flow. There are no grade crossings and there are enough lanes to permit segregation of traffic of several normal speeds, and with provision of deceleration and acceleration lanes where necessary.

Mistaken critics of automobile speed were taken to task by Dr. McClintock, who pointed out that speed was an essential quality of an automobile just as the ability to cut is an essential quality of a knife. Both are dangerous if misused, but the removal of the essential quality naturally makes the instrument worthless for the function it is intended to perform. Nobody has suggested that every knife should be sold with a guard on its cutting edge. That would retard its functional performance. It is just as illogical, he indicated, to talk of equipping motor vehicles with governors at the factories. The safe performance of function must be left in the hands of the driver, and it's the driver problem which must get basic handling.

ENGINEERING of motor vehicles cannot be dominated by production, sales or advertising requirements if it is to flourish. This categorical statement by Fred M. Zeder, vice-chairman of the board of the Chrysler Corp., was part of a stinging indictment of all attempts to interfere with the proper place of the engineer in management, delivered by Mr. Zeder at the S.A.E. banquet, at which the Detroit Section was host to the general society.

Mr. Zeder's Jeremiad extended to governmental interference. "It is futile," he said, "to insist that industry can absorb all the unemployed. It simply can't be done, and none but a politician would think it could." In this connection he called attention to the radio addresses of William J. Cameron

Papers

Completing the

Review of

New Ideas

and Themes

of the Ford Motor Co., which have opposed consistently the errors of government on this question.

The economy of scarcity felt Mr. Zeder's lash. "Prosperity," he thundered, "is the result of progress in industry, the development of new products and new ideas. It is the result of more work and not less work, and can't be promoted by attention to the birth control of pigs."

AT the student session, O. T. Kreusser, director, Museum of Science and Industry, Chicago, and former director of the General Motors Proving Grounds, gave the audience "An Objective View of the Automobile Industry" which led him to the conclusion that automobiles may occupy an even larger place in the national economy in a very few years.

"We are becoming a mobile population," Mr. Kreusser said, "and if this

continues to its logical end, we shall find erected all over the land great hotels which are essentially servicing stations for those who travel by automobile. The travel itself will be in vehicles which combine many of the functions of living quarters with mobility, and the 'hotels' will provide for nominal rates, those essentials of food and linen, etc., which it would be inconvenient to carry along.

"The old school of average success which made a man save to buy a house and lot may be replaced by a new way of thinking which makes him save to buy a car which shall become his castle."

ity exposed provides a finger hold for pulling the door open.

Deep tunnels for the propeller shaft were not well received by the purchasing public, and in the present front-engined cars they are avoided by the use of a drop drive at the engine and a hypoid rear-axle drive. The individually movable seat is in universal use. The compact powerplant now employed at the front, as well as the rear-mounted powerplant, has eliminated the long hood and with it complaints of inadequate vision.

Spaciousness has been obtained by utilizing the total width of the vehicle for the body, making running boards unnecessary and replacing them by rub rails. The appearance of motor buses of such design that the floor area is utilized for passenger accommodation to the greatest possible extent must be credited with the present trend toward better space utilization in passenger cars.

Engine displacements in general have not increased, and in a number of cases they are smaller. The general use of the overdrive principle, the supercharger, and reduction of air resistance have changed the picture completely. Several makers provide a fuel-injection nozzle at each intake port for better distribution. In front-engined cars the carburetor, air cleaner, silencer, fuel pump and fuel lines are located in a separate compartment over the engine "oven," from which it is divided by an insulated partition, and cool air from the outside flows into it from the grille and above the radiator core. A thermostatically controlled door in the partition and behind the

Looking to the Future

IN a paper entitled "Futuristically Speaking," Austin M. Wolf, automotive consultant of New York, adopted the style of Jules Verne and reviewed the passenger-car practice of some indefinite future year as though it were a thing of the present. Following are some of the noteworthy automotive developments foreshadowed by the author:

Tail ends have been notably improved, the projecting bulbous trunks of former years being replaced by inside luggage compartments in front-engined models and by the compartment ahead of the windshield in rear-engined cars. The welded body and frame is almost universal. The entire body sides, including the wheel enclosures, window and door openings, the

steep-angled (in plan and elevation) windshield and rear-window portions, the tail and the roof, are stamped out in halves and flash-welded together. In one car a plastic material is molded directly over the light-alloy framework. The doors are also molded over a framework.

Air conditioning permits of sealing all windows and of making exteriors quite smooth. One maker has combined the engine and brake cooling provisions with those for air conditioning. Exterior moldings have been entirely eliminated. The flush handle still enjoys popularity; it is now flush with the door panel and snaps outwardly at one end when a release button is touched. Another flush handle is pressed inwardly to release the bolt, and the cav-

grille provides intake air of the desired temperature.

Fuels and oils are treated during the process of production in such a manner as to eliminate any corrosive influences of the products of combustion. Carbon troubles have vanished with better temperature control, better oil control, reduced crankcase dilution, and better engine-load control due to the use of more flexible transmissions.

Magnesium pistons are popular in view of the high engine speeds. Cylinder bores are now ground while the blocks are heated by the induction system, as are also the bores for rotary

valves. Independent suspension has been applied also to the rear of the vehicle. Hypoid gears have progressed still further. The differential at last is provided with a control to prevent wheel spinning. To prevent unequal pressure distribution on brake drums, radially expanding segments have been adopted. The torsion-bar method of suspension has replaced some of the coil springs in the parallel link and swinging arm types. The placing of the hand brake lever on the instrument board in 1935-36 was followed by the removal of the gear-shift lever to the same location, which clears the front compartment.

one "oiliness" compound actually increased wear. From the standpoint of both, additions of 1 per cent palmitic acid or 10 per cent rape oil seem to be most effective.

Another series of tests was in regard to the effect of piston skirt clearance on cylinder and ring wear. It was found that as the skirt clearance increased from 0.005 to 0.030 in. the cylinder wear increased only very slightly while the wear on the top piston ring increased from 0.0001 in. per 1000 miles to 0.0007 in. (1600 r.p.m., 60 lb. b.m.e.p., 250 deg. F. cylinder-wall temp., oil supply 100 cu. cm. per hr.). It was concluded that the increase in top-ring wear with clearance was due mainly to tilting of the ring.

When the radial pressure of the ring was increased from 6 to 21 lb. per sq. in., the cylinder wear per 1000 miles increased from 0.00008 to 0.00014 in. and the top ring wear from 0.00075 to 0.0016 in. Rather interesting results were obtained in tests with piston rings varying in width from 3/64 to 3/16 in. It was found that both the top ring wear and the cylinder wear decreased greatly as the ring width increased, although the specific pressure remained constant. The top ring wear decreased from 0.0008 in. per 1000 miles with 3/64-in. rings to 0.00006 in. per 1000 miles for 3/16-in. rings, and the cylinder wear from 0.0001 in. per 1000 miles for 3/64-in. rings to 0.000025 in. for 3/16-in. rings. It was found that under conditions of abrasion the ring width is an important factor, probably because of the ability of the wider ring to maintain a thicker oil film.

Ring Width Is Important to Wear

A PAPER by C. G. Williams, Director of Research of the Institution of Automobile Engineers, dealt with the research work on cylinder wear which has been carried out by the Institution under Mr. Williams' direction. A good deal of this has already been covered in two reports which were printed in abstract in *Automotive Industries* at the time they were issued. The paper, however, also gave some as yet unpublished results.

One series of tests related to the effect of mixture strength on cylinder and ring wear, which was thought to be important because during the starting process the mixture strength usually varies through a wide range. It was found that as the mixture ratio changed from about 14 to 1 to about 8 to 1, both the ring wear and the cylinder wear decreased in a straight-line relation. To determine the effects of various so-called "oiliness" additions, tests were run with medicinal paraffin (mineral white oil) as a base. This is known to have very poor lubricating qualities. It is practically free from unsaturated and polar compounds and has been shown to be very deficient in the oiliness property. A number of intermediate runs were made between tests when changing from one lubricant to another, until the rate of wear had become constant. With the medicinal paraffin the rate of cylinder wear was of the order of 0.010 in. per 1000 miles. It was reduced to 0.0011 in. by an addition of 1 per cent oleic acid, to 0.0012 in. by 1 per cent of palmitic acid, to 0.0006-0.0010 in. by 1 per cent triolein, to 0.0010 in. by 10 per cent rape oil, to 0.0008-0.00078 in. by 10 per cent aromatic extract, and to 0.0006 in. when using a proprietary mineral oil blend. The latter figure is of the same general order as those for the rates of wear with the oiliness additions.

Measurements of wear on the top piston ring can be made with much greater accuracy than measurements of cylinder wear and the former are recommended for making comparative wear tests as between different lubricants. The top ring wear per 1000 miles was as follows with the various lubricants:

Medicinal paraffin	0.00017
+ 1 per cent oleic	0.00040
+ 1 per cent palmitic	0.00012
+ 1 per cent triolein	0.00012
+ 10 per cent rape	0.00009
+ 10 per cent aromatic	0.00037
Commercial engine oil	0.00016

These tests emphasize that oiliness is necessary to combat cylinder corrosion, but not to combat abrasion. In fact,

Sticking Pistons—Cylinder Life

CYLINDER wear and piston-ring sticking tendencies were discussed in a paper by C. M. Larsen, W. G. Ainsley and M. Fairlie of the Sinclair Refining Co., the discussion covering automobile, bus and aircraft engines. It was stated that analyses of top-groove deposits from engines run in atmospheres relatively free from dust had shown 88 per cent (mostly carbon) insoluble in CHCl_3 and 10 per cent ash containing metallic oxides. Mirror finish has reduced cylinder wear considerably, while hard cylinder liners (450 Brinell and higher) increase piston and ring wear materially unless the bore has a very high finish.

Wear occurs in normal service during periods of cold starting and warming up. Oil characteristics that tend to make starting easy, such as a high vis-

cosity index and a low pour point, have favorable effects from this point of view. Stability is also a desirable feature in that excessive tar formation, viscosity rise, and carbon-residue rise lead to deposits under piston crowns and under piston rings. This in turn will cause ring sticking, which will increase blow-by, oil consumption, cylinder wear and scoring.

Tests on piston-ring sticking indicate that this is largely governed by cylinder-surface temperatures and the various factors that control it. It has been found by dynamometer tests that at jacket temperatures not exceeding 190 deg. F., normal automobile engines may be run on oils containing up to 5 per cent tar, an exceedingly high figure, without causing stuck piston rings. As the jacket temperature rises, the

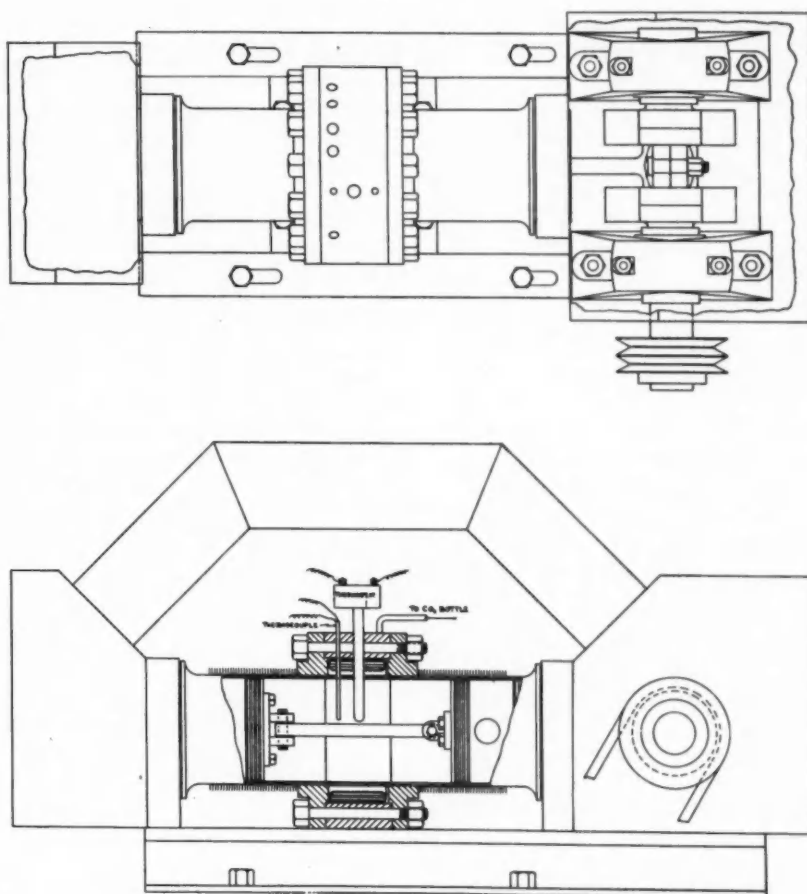
susceptibility of the oil to depreciation becomes much greater, and 250 deg. F. is a good jacket temperature for tests to give reasonably good indications of the ring-sticking properties of oils. At higher temperatures the results become somewhat erratic.

Some tests on ring sticking were made specifically to determine the effect of fresh oils, as compared with the materially depreciated oils usually present in the engine when ring sticking occurs. These tests covered both a stable and an unstable oil. The runs on the unstable oil resulted in an average of two out of three rings being stuck in each piston, suggesting that the decomposition of this oil, while it is actually in and passing the piston ring grooves, caused the rings to stick. There was practically no change in the oil. However, the original carbon residue of the stable oil was about ten times that of the unstable oil. This suggests that low original carbon residue is not so important a factor as general stability, which prevents rise in carbon residue, viscosity, and tar formation in service.

From this study the following conclusions were drawn:

1. Only a small portion of the total automotive engine wear may be attributed to the effect of properties of the lubricant.
2. Assuming high mechanical and combustion efficiency, the ring sticking tendencies of a gasoline engine depend to a considerable extent upon the general stability of the lubricant. The longer the characteristics of the fresh oil persist in actual service, the freer will the engine remain from piston ring sticking.

To study the factors affecting wear in aircraft engines, a series of tests was run on twelve 420-hp. nine-cylinder air-cooled engines using 80 octane leaded fuels. Each plane was twin-engined, and the engines were designated by plane number and whether left (L) or right (R) mounted. Test flights were conducted over regularly scheduled air routes, with cruising speeds of well over 200 m.p.h. The total flight hours for each engine varied from 350 to 418 hours. The engine lubricating oils under test were drained at approximately 50-hour periods, and fresh oil of the same make put in, until each engine had 350 or more hours.



Part section and side elevation of aircraft laboratory equipment for studying ring wear

Then the engines were taken down for checking and inspection. Results from this test were given in tabular form in the paper.

The results of these flight tests naturally depend on a good many variables, including the personal factor of the pilots, state of the engine (new, used or reconditioned), air/fuel ratios, head temperatures, and oils. It was therefore decided to study ring wear in the laboratory, and Fig. 1 shows a laboratory equipment for studying ring wear in aircraft cylinders. Two standard aircraft pistons are connected back to back, so as to carry a balanced pressure of gas between them, to simulate the m.e.p. (185 lb. per sq. in.) of the aircraft engine. The heater, thermocouple, thermostat and gas connection are also shown. By means of this set-up, ring wear can be studied under varying conditions of temperature, speed, etc., and for different metals.

istics of the airplane, the type of landing gear used, the pilot's range of vision, and the comfort of the cock-pit from the standpoints of vibration, noise and seating arrangement. The side of the problem that has received the least attention so far is that of flying characteristics and this subject was covered at considerable length in a paper by Otto C. Koppen, of Massachusetts Institute of Technology. Mr. Koppen recommended that when an airplane is designed particularly for amateur pilots, besides the usual requirements, the following characteristics be given particular attention:

The natural period of any oscillation should not be less than fifteen seconds.

Any oscillation should damp to less than one-half amplitude in less than one period.

For the landing condition, the added parasite drag to steepen the flight path should be variable with control position.

The rate of change of stick force with stick movement should be increased beyond the value normally obtained in the basic design.

Special Planes for Amateurs

FOR the past several years there has been a decided trend toward making flying easier for the amateur pilot.

There are many factors that enter into the process of making flying less difficult, such as, the flying character-

Cylinder-Wear Measurement

A METHOD of continuous cylinder-wear measurement was described in a paper by G. D. Boerlage and B. J. J. Gravesteyn of the Shell Petroleum Corporation. A single-cylinder test engine is used, and the cylinder has an oil supply independent of the crankcase supply. Oil dripping off the piston while the engine is running is collected, and samples are tested for ash, the amount of which appears to be a good index of the rate of cylinder wear. Tests by this method were made on a single-cylinder Diesel engine of 50 hp. The engine was fitted with a sliding baffle which kept crankcase oil from the cylinder walls, and with a gutter for collecting oil dripping off the piston. When using gas oil, the amount of ash was usually about 0.06 per cent of the amount of oil fed to the cylinder at full load. The method was found to give results that are reproducible.

The method can be used to determine the relative rates of wear with different fuels and different lubricants, and the ratio of the rate of wear with any particular fuel (or lubricant) to that with a standard fuel (or lubricant) is referred to as the wear factor. The tests confirmed the finding of previous investigators that the rate of wear is very high when first starting from cold.

Generally from 80 to 90 per cent of iron oxide is found in the ash, the other 20 to 10 per cent consisting of other substances originating in the fuel, lubricant or combustion air, or in the piston-ring and liner material. Some

of the iron oxide found in the ash may originate in the fuel, and to get light on the question as to how much of any iron content in the fuel would get into the oil ash, the fuel was injected with copper naphthenate, and from the ratio between the amount of copper entering the engine and the amount with the fuel recovered from the ash, conclusions were drawn as to the proportion of any iron in the fuel that would get into the ash of the oil samples. It was found that with metal percentages of 0.01 to 0.05 in the fuel, 0.5 to 1.0 per cent of the total quantity of the metal reaches the crucible, forming from 10 to 50 per cent of the wear products.

Heavy residual fuels, as a rule, caused somewhat greater wear, but no difference in wear could be observed when using different cylinder oils on the market (under normal operating conditions). The rate of cylinder wear decreased as the load decreased from 90 to 45 per cent, but increased with a further reduction in load. Organic acids added to the fuel did not affect the rate of wear. A decrease in the jacket temperature from 194 to 77 deg. F. did not affect the rate of wear, but it was pointed out by S. D. Heron, who presided at the session, that this rather unexpected result might be due to the fact that the cylinder in the test was not lubricated with crankcase oil, but with oil from an outside source. Water taken into the cylinder with the air increased the rate of wear considerably.

largely overcome with practice, and a visit of a Waukesha engineer to each of the laboratories taking part in this work helped materially in this connection.

Another important problem of the Volunteer Group was the selection of a suitable scale for expressing ignition quality. For some time past the "cetene-number" scale, based on mixtures of cetene and alpha methyl naphthalene originally proposed by Boerlage and Broeze, had been more or less generally adopted. It is the alpha isomer of cetene ($C_{16}H_{32}$), an unsaturated hydrocarbon of the ethylene series, that is desired. However, it was found that successive batches of cetene produced by different laboratories from various sources and of supposedly similar properties did not always have the same ignition quality. This is thought to be due to the fact that the position of the double bond of cetene may shift during production, thus giving any one of the various isomers, all of which have different ignition qualities.

As a result of cooperative work with E. I. du Pont de Nemours & Co. it was decided to investigate cetane ($C_{16}H_{34}$), also known as normal hexadecane, a straight-chain hydrocarbon without double bond. This is a pure compound, inherently stable, and can be readily reproduced. The ignition quality of cetane is somewhat higher than that of cetene, and so far cetane has proven quite satisfactory as a primary reference fuel. Cetane is obtainable at approximately \$35 a gallon from E. I. du Pont de Nemours & Co., Organic Chemicals Department, Wilmington, Del.

Alpha methyl naphthalene ($C_{11}H_{10}$), a pure aromatic hydrocarbon, has been found a satisfactory primary standard low reference fuel. It can be obtained from the Reilly Tar & Chemical Co., Indianapolis, Ind., at approximately \$6 per gallon. Table I gives the properties of both cetane and alpha methyl naphthalene.

	Cetane	Methyl-naphthalene
Specific Gravity 60/60	0.775	1.011
Boiling Range, °C.	284.5 to 289.5	232 to 236
Freezing Point, °C.	16.4	15.4
Iodine Number.	Nil	

The above primary reference fuels have been adopted by the Volunteer Group, and all results are expressed in terms of cetane numbers. The cetane number of a fuel is the percentage of cetane in admixture with alpha methyl naphthalene that matches the ignition quality of the sample.

Owing to the high cost of primary reference fuels, it was found necessary to consider the adoption of secondary reference fuels in their place. A secondary high reference fuel, used in

Fuels Are Investigated

A REPORT of the Volunteer Group for Compression-Ignition Fuel Research was presented by its chairman, T. B. Rendel of the Shell Petroleum Corp. It incorporated a suggested tentative procedure for operating the modified CFR engine, a recommendation as to the use of standard reference fuels and secondary reference fuels, and the results of a series of cooperative tests on the measurement of ignition quality on nine different types of Diesel fuels.

The Group from the first worked with the delay method, and in doing so met with two difficulties, one due to unsteadiness of the injection equipment with respect to timing, the other due to irregularities in the operation of the bouncing pin. A number of improve-

ments were made in the test apparatus, principally in the fuel injection system and the bouncing-pin set-up. Unsteadiness in the injection system seemed to be due to air locks in the fuel line, and a number of changes were made to overcome this, one being the use of larger fuel tubes. The method of recording the timing of fuel injection was improved by making use of the "make" instead of the "break" of the electric circuit, whereby arcing was prevented. The make-and-break device used in connection with the bouncing pin is now driven from the tachometer drive shaft instead of from the fuel-injection pump, which permits of varying the injection timing independently. Difficulties with the bouncing pin were

place of cetane, can be obtained from the Shell Petroleum Corp., Wood River, Ill., at approximately 80 cents a gallon in five- or fifty-gallon lots. This material is a straight-run gas oil from a crude obtained from a small field in southern Illinois.

Commercial methyl naphthalene (a mixture of alpha and beta methyl naphthalene) is also obtainable from the Reilly Tar & Chemical Co. at approximately \$2 per gallon. This commercial grade has an ignition quality which closely approximates that of pure alpha methyl naphthalene, and has proven entirely suitable as a secondary reference fuel.

Among future problems of the Group, Mr. Rendel said, is that of determining the validity and significance of the proposed method of measuring ignition quality; also that of examining other possible methods of measuring ignition quality. In concluding the report he said that cetane number is the most suitable method of expressing the ignition quality, and determining the cetane number by the delay method in the modified CFR engine with a high-turbulence head appears to be the most satisfactory. It still requires further work on the method of registering ignition delay and on steadying the fuel-injection timing, as the present bouncing pin is at times difficult to keep in adjustment, which results in delays in testing. However, in view of the fact

that it still takes 45 minutes to make an octane-number test, after three years of development of the system, adoption of the cetane-number system as a tentative standard and of the suggested method of determining cetane numbers need not be delayed further.

A chart accompanying the report showed that the results obtained with the delay method by the thirteen co-operating laboratories ranged from minus 8 to plus 4 of the average for a particular fuel, and in the discussion it was pointed out that inasmuch as the usable range of high-speed Diesel fuels extends only over about 20 cetane numbers (from 40 to 60), the method still seems to leave much to be desired from the standpoint of precision.

In the paper presented at the same session by Dr. P. H. Schweitzer and T. B. Hetzel of Pennsylvania State College, a substitute for the bouncing pin was proposed, which would eliminate its faults. It appeared from Mr. Rendel's remarks that the volunteer Group is not prepared at this time to adopt the proposed substitute, although it recognized the ingenuity of the proposed equipment, and the hope was expressed that some of the members would experiment with it. In addition to the fact that it eliminates the irregularities experienced with the bouncing pin, it is claimed for the Penn State equipment that it permits of obtaining results very quickly.

ness is maintained to a remarkable degree as the case depth is increased above the usual 0.006 in. With respect to distortion, the new method is a distinct improvement over the cyanide. It is believed that this is due to the slower heating rate and longer total time in the furnace, which are natural characteristics of this type of furnace. Preliminary dynamometer and road tests indicate a durability at least equal to that of cyanided gears.

According to the author, recent improvements in automobile gears has been due mainly to improvement in steels and in the techniques of their manufacture and processing.

Gear noise is primarily caused by improper tooth contact, which may result from incorrect design, inaccurate machining, or distortion in heat treatment. Providing the engineer has done his part, machining and hardening share the responsibility for gear noise. As long as the distortion is uniform it can be compensated for in the machine shop, and it is variable distortion that constitutes the most serious problem.

The steel used for Buick gears is made by the open-hearth process and is purchased to specification G.M. 3145-A, which is identical with S.A.E. 3145 except for the carbon range, the suffix "A" denoting a five-point range—in this case 0.43-0.48. In addition to composition, the requirements cover grain size, normality, banding, inclusions and macro-structure. Samples are taken from each heat of steel as it is received, and the material is held in the steel yard until released by the metallurgical department.

Grain size is specified as 6-8, and is determined in accordance with the standard procedure. The same sample is also examined for normality and banding, and given ratings based on certain arbitrary standards. Special attention is paid to duplexing, which is believed to be responsible for certain variations of an especially undesirable nature.

Inclusion ratings are obtained by comparison with the General Motors

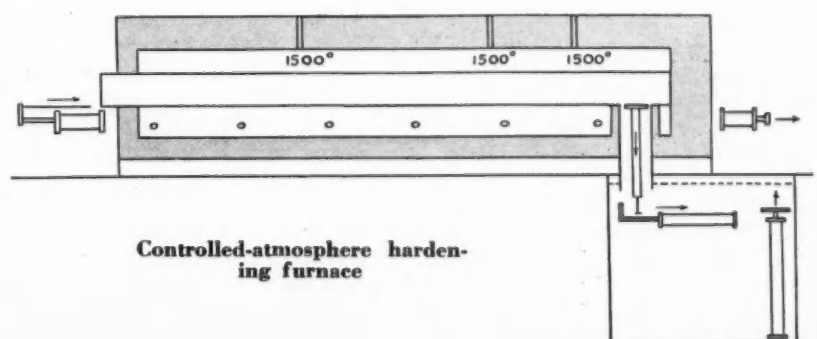
High Carbon Gears Made Harder

ONE of the most interesting features of the paper, "Metallurgy of Transmission Gears," by R. B. Schenck of the Buick Motor Co., was a brief description of an improved method of hardening high carbon gears which offers certain advantages over the cyanide process.

The equipment consists of a continuous gas-fired muffle furnace with automatic temperature regulation and controlled atmosphere. Auxiliary equipment is provided for gas conditioning. A line drawing of the furnace is shown in Fig. 1. The gears are placed on skeleton trays and pass through the muffle and quenching tank as indicated by the arrows. Conditioned gas is passed through the muffle to produce the desired atmosphere. The muffle is 22 ft. long from the outer door to the chute, 3 ft. 2 in. wide and 17 in. high. The capacity is 1200 lb. per hour with a total time of 88 minutes. The temperature setting for the three zones is 1500 deg. F.

With the proper atmosphere, a case

averaging 0.006 in. is obtained. This case is of excellent quality and is slightly hyper-eutectoid, with the excess cementite in spheroidal form. Gears from this furnace, after being quenched, are drawn at the usual temperature of 450 deg. F. and show an increase in Rockwell hardness over the cyanided gears of about 2 points. The toughness is distinctly better than that of the cyanided gears, and this tough-



Inclusion Chart. Numbers are used in place of letters, with a scale of 0, 1, 2, 3 corresponding to D, C, B, A and ranging from bad to good. In this way, a numerical average can be obtained for a number of heats. An average inclusion rating of 2 or better is considered satisfactory. Individual heats showing a rating of 0 on a sufficient number of samples are subject to rejection.

The Buick cyanide hardening equipment is served by a conveyor system of the "jack rabbit" type which carries the gears through the complete cycle, consisting of preheat, four cyanide pots, quench, wash, and rinse. The five furnaces are independent units standing on legs and can be moved by means of an electric truck. When a pot burns out, or other repairs are needed, the fuel and air lines are disconnected and a spare unit, which is always held in readiness, replaces the one to be repaired.

The time cycle is 6 minutes, which makes a total of 24 minutes in the four pots. The capacity of this equipment is

800 lb. per hour. The gears are suspended from the conveyor on suitable fixtures, spaced so as to provide uniform quenching conditions. The oil flow is automatically shut off for 90 seconds when the gears go into the quench tank, as it was found that distortion could be more effectively controlled with still oil. The temperature of the first pot is set just below the A_{c1} point of the steel, and that of the last pot just above the A_{r1} point. This combination seems to decrease shock in both heating and quenching.

The cyanide case obtained averages about 0.002 in. It is purposely held to this low figure because it is believed that the least thickness of cyanide case that gives adequate wear resistance is the best. While no test data are available to either prove or disprove this point, it is believed that a heavier cyanide case is not beneficial and may be detrimental to the fatigue resistance of gear teeth with a core hardness of C-50 or above. There is ample evidence that a cyanide case decreases shock resistance.

herent tendency to knock under certain critical conditions. Since neither benzol nor alcohol was available from an economic standpoint for use as anti-knock material, it was deemed wise to attempt to eliminate this knocking by the use of some material which would not affect the other characteristics of the fuel. Accordingly, a search was begun for some substance which when added to gasoline in very small quantity, would eliminate the knock. More than 30,000 compounds were investigated before a suitable one was found. Some were rare and difficult to obtain, while others had to be made in the laboratory. Eventually a number was found which had anti-knock value, but most had definitely objectionable characteristics, which precluded their commercial use.

The first of these was iodine, which was effective but expensive, the commercial supply of it was small, and when it was burned in an engine, its effect upon the parts was decidedly objectionable. Other anti-knock materials also had objectionable characteristics, making them commercially impractical. But when a number of these compounds had been discovered and checked on the periodic table of chemical elements, it was noted that they fell into a definite arrangement from which other products having anti-knock value could be predicted with reasonable accuracy. By following this line of research, an organic compound of lead, known chemically as tetraethyl lead, $Pb(C_2H_5)_4$, was discovered. This material is a water-white liquid approximately twice as heavy as gasoline and completely soluble in it, and it has the highest anti-knock value of any commercially-available material of which we know.

At the time of this discovery, tetraethyl lead was extremely expensive, but it was composed of lead, carbon and hydrogen, all of which are plentiful and cheap. The problem was to combine them cheaply into a commercial product, and before this was accomplished considerable research was necessary. Finally there remained the problem of determining the proper method of treating gasoline with this anti-knock material. Thousands of engine tests were necessary before a satisfactory formula was developed. This formula contained tetraethyl lead, ethylene dibromide and ethylene dichloride. The effect of the last two compounds was to keep the products of combustion of the lead in gaseous form, so that they would pass out of the engine, instead of being deposited in it. Of course, the original formula has been improved from time to time, but these three elements, plus a red dye for identification purposes, constitute the present ethyl fluid with

The Story of Ethyl

THE story of ethyl fluid and ethylized gasoline was told in a paper on "The Influence of High-Octane Gasoline on Engine Design," which F. R. Speed of Ethyl Gasoline Corporation presented at the Junior-Student Session on Monday evening.

The Cadillac 1912 car was the first to carry an electric starter as regular equipment, and it also had a battery ignition system. No efforts had been spared by the manufacturer to make this a really high-class car, yet when it was placed in service it proved to have a serious shortcoming. When climbing hills or accelerating rapidly in high gear, the engine developed a severe spark knock, and if operation was continued under these conditions, overheating and a loss of power resulted. The knocking tendency was so pronounced that it definitely interfered with good performance. The car maker at first blamed it on the new battery ignition, but the manufacturer of the ignition unit was not satisfied that the cause was to be found there.

About the same time the manufacturer of the ignition unit, the Dayton Electrical Laboratories Company, had under development a small farm lighting set. Originally the Delco light plant was designed to be run on gasoline, but the Underwriters Code at the time forbade the storage of gasoline in a private dwelling in sufficient quantity to run such a plant. Since the code per-

mitted the storage of a considerable quantity of kerosene, an attempt was made to use that fuel. However, the engine knocked so badly that it was feared it would be ruined in short order, and, besides, it would not develop sufficient power on kerosene to operate the plant satisfactorily.

As a result of these experiences it was decided to study the phenomenon of knocking, to determine its cause and eliminate it if possible. At first it was believed that the problem was a mechanical one and would have to be dealt with by changes in the engine; no one realized that gasoline had anything to do with it.

After suitable instrumentation had been developed it was discovered that the knock was due to certain characteristics of the fuel itself. It was already known that kerosene knocked worse than gasoline, and now it was established that some gasolines knocked worse than others and that there were certain liquids that were so free from knocking tendency that they could be used as anti-knock fuels. These latter include benzol and alcohol which, when mixed with a knocking fuel, definitely reduce its knocking characteristics.

Gasoline was the best fuel yet discovered for internal-combustion engines, as it was more powerful than most others, and the liberation of energy from it was easy to control.

Its only important fault was this in-

which nearly 80 per cent of the domestic consumption of gasoline is now treated to improve anti-knock values. The maximum amount of this fluid required

to produce the highest octane premium motor fuel is approximately one teaspoonful for each gallon of the gasoline treated.

vided. During the last five years the fin-pitch or fin spacing of Cyclone cylinder heads has decreased from 0.375 to 0.218 in. and the depth of the fins has increased since 1931 from $\frac{3}{8}$ in. to $1\frac{1}{2}$ in. The fin area of the head has increased from 628 to 1900 sq. in., the fin area per cu. in. piston displacement having increased in the ratio of 3.2 to 9.4.

There are two general methods of automatically controlling the mixture strength furnished by the carburetor, namely, (1) by regulating the density of the air furnished to the carburetor and (2) by permitting the variations in the density of the carburetor air supply to regulate the fuel flow. This latter principle has certain inherent advantages and is embodied in a device which was developed jointly by the engineers of the Wright Aeronautical Corp. and the Bendix Stromberg Co. The effects of changes in the air density on the float-chamber pressure control the effective metering head of the main discharge nozzle. The design was incorporated in a Stromberg four-barrel downdraft aircraft carburetor, which Mr. Young described as the most advanced and most widely used carburetor of its type.

Aero Fuel Economy

THE specific output of radial air-cooled aircraft engines has greatly increased during the past decade, according to Raymond W. Young of the Wright Aeronautical Corp., who read a paper on "Performance Possibilities and Means for Obtaining Maximum Fuel Economy in Flight." As exemplified by Cyclone engines, the rated b.m.e.p. at sea level increased (between 1925 and 1935) from 116 to 211 lb. per sq. in.; the specific weight based on sea-level output decreased from 2.17 to 1.27 lb. per hp.; the piston displacement increased from 1650 to 1820 cu. in.; the compression ratio increased from 5.30 to 6.85; the rated crankshaft speed increased from 1625 to 2100 r.p.m., and the average time between overhauls increased from about 150 to 400 hrs.

With the recent introduction of a trans-oceanic service there has come a demand for better fuel economy, to increase the possible payload and the safe cruising radius, as well as for reasons of economical operation. Military requirements tend in the same direction.

Aircraft engines are usually provided with a manual mixture control and pilots are instructed to "lean" the mixture when they have attained their cruising altitude, moving the control lever until the tachometer shows a speed drop of approximately 20 r.p.m., then moving the lever back sufficiently to get back to the original engine r.p.m. But there is so much to engage the attention of the pilot that fuel-mixture adjustment is often deferred until more pressing matters have been attended to. Often the adjustment is not made at all, because the pilot fears burned exhaust valves and seats and excessive cylinder wear as a result.

Recognizing the need for an instrument which would give the pilot visual evidence of the effect of a change in the mixture ratio on the performance of the powerplant, the Wright Aeronautical Corporation somewhat over a year ago encouraged the Cambridge Instrument Company to develop its automotive exhaust-gas analyzer for aircraft use. This instrument is based on the principle of the Wheatstone bridge, two branches of which are sur-

rounded by exhaust gas and the other two by atmospheric air. The resistance of the branches depends upon the heat conductivities of the gaseous media surrounding them, which in the case of those surrounded by exhaust gas depends on the composition of the latter. Any change in the composition of the exhaust gases results in the deflection of a galvanometer, the indicating hand of which passes over a scale graduated in fuel/air ratios.

The current Cyclone engine has a hemispherical or dome-shaped combustion chamber, which type has been found most satisfactory because it offers maximum resistance to deformation and minimum wall area, and also because it is readily adaptable to efficient porting. For efficient cooling of such a head, cooling fins of extreme depth and close pitch must be pro-

Custom Building Production Cars

V. P. RUMELY of Hudson Motor Car Co., in his paper, "Custom Building Production Cars," concludes that since a great variety of options is desirable to meet the public's fancy, it should be provided for at the time the car is built and the production department should find out how it may be done at a profit to the manufacturer.

An estimate of the options demanded by the public indicates that a bank of over a million cars would be necessary if one were to fill orders from cars in storage. To handle options economically in production, it is essential to develop suitable techniques of scheduling, materials control, and stores control. Sales forecasting is a vital element of the set up, since it is necessary to estimate in advance what kind of materials must be ordered from the various suppliers.

"At the Hudson Plant a 10-week advance schedule, known as the 'A' schedule, is compiled by the sales department in the form of an estimated weekly total for each model and body type. This schedule is revised weekly in accordance with the sales trend. A supplement to the 'A' schedule, issued

by the sales department and known as the 'B' schedule, gives totals for all optional equipment required over this 10-week period. It, like the 'A' schedule, has estimated amounts for the last eight weeks, and definite amounts for the first two weeks, and is furnished the planning department on Wednesday morning of the first week.

"It is highly essential that the purchasing, the tracing and the stores departments follow the schedule revisions closely, so as to have available the required parts and options for building the car starting 7 to 6 days hence.

"In order to have material available, the purchasing department will make a buy of, say, one-eighth, one-fourth, or one-half of the year's supply; varying its policy upon the amount (for all or certain parts) according to market prospects or price, delivery time, and business conditions. This buy is a commitment for raw materials. Actual fabricating of most items is not done until a definite release to manufacture is furnished by the tracing or follow-up department. This release is based upon the data in the next four weeks'

sale schedule. As frequently happens, these fabricating releases will be excessive or insufficient, especially as they apply to options. Surplus estimates can generally be used up in the several succeeding weeks, by holding back fabrication through a corrected schedule to the supplier. It is when releases are exceeded by the car orders that some very snappy action becomes necessary."

Planning and scheduling through the plant is under control of a planning department, using teletype control stations at strategic points in the factory. A weekly sales schedule given the planning department on Tuesday covers

one week's schedule beginning the following Monday. Three days advance notice is required for building and painting bodies, five hours to trim a body and mount it on the chassis. About 3½ hours elapse between the time a car is off the line and the time it is ready for shipment.

Among the problems of the planning department is the important one of selecting the proper grouping of types of cars to be run off during the course of the hour. It is necessary to schedule a balanced group of types and options so as not to overtax the door trim and hardware assemblers one hour and keep them idle the next.

Cylinder-Wear on Aero Engines

ROBERT INSLEY of United Aircraft Manufacturing Corporation had gathered material from aircraft engine manufacturers and users on the subject of piston-ring and cylinder-wear in aircraft practice, and while material had come to him aplenty, it showed an appalling lack of conformity. The piston-ring and cylinder-wear problem, Mr. Insley said, is becoming increasingly difficult, because of the constant demand for more power per cubic inch or per pound. In ten years m.e.p.s. and piston speeds have gone up nearly 40 per cent, while specific fuel consumption has dropped at least 20 per cent and specific oil consumption about 50 per cent.

The standard chemical composition of piston-ring iron used, up to quite recently at least, is shown in the accompanying table.

The hardness of these rings averages at least 100 Rockwell B. Among unconventional rings, the author men-

tioned a type made with two projecting strips of bronze which, used in the top groove only, seem to be particularly suited to chromium-molybdenum barrels, but so far have "refused to behave" in nitrided bores.

From the mass of data gathered by him on the subject, the author drew the following conclusions:

Effective temporary expedients to produce satisfactory cylinder and ring behavior are in use, but the basic causes and a general formula for preventing excessive cylinder and ring wear are still to be discovered.

Chemical Composition of Piston Ring Iron

Combined Carbon	0.50-0.75
Graphitic Carbon	2.70-3.15
Manganese	0.45-0.80
Phosphorus	0.45-0.75
Sulphur	0.09 max.
Silicon	2.55-3.15

Relatively soft plain cast iron rings still seem to be the most successful.

Carbon steel on chromium-molybdenum cylinders can be used satisfactorily with conventional rings.

Hardened, especially nitrided, cylinder barrels are now dependable and in general will show definitely less wear than carbon steel or chromium-molybdenum barrels.

Best ring and cylinder operation is obtained with cylinder bores as nearly straight and round as possible and with lapped surfaces.

As a rule, the oils which reduce ring and cylinder wear promote ring sticking, though there is evidence that lubricants definitely superior to present standard products in both particulars will be available soon.

Blow-by is one important cause of ring and cylinder wear.

Ring and cylinder wear is aggravated by increase of operating speed.

Fancy rings and ring expanders apparently serve no useful purpose.

Dry wear tests seem to have some significance in predicting behavior of materials in engines.

Development for Simpler Flying

FRED E. WEICK, senior aeronautical engineer of the N.A.C.A., presented a paper on "Everyman's Airplane, a Development Toward Simpler Flying."

In 1931 the author enlisted the aid of several engineers of the N.A.C.A. staff to make a private study in their spare time of the problem of making the airplane more suitable for general individual use. They worked with specifications for an "ideal" private airplane, and built and tested large flight models of three promising forms. On the basis of one of these they designed and built the W-1, starting in the summer of 1932. This was a two-place cabin monoplane with 75-85 hp. Pobjoy engine installed as a pusher, to give the pilot the large field of view that was considered essential. The most novel features, in addition to the general arrangement, were the stable three-wheel landing gear and the fixed auxiliary airfoil ahead of the main wing.

As the construction was being completed, the Department of Commerce, which had just started its light airplane development program, became acquainted with the project and requested that the N.A.C.A. test the plane officially.

Engine Nacelles and Propellers

AN important improvement in airplanes fitted with radial engines consisted in the application of cowlings, notably the N.A.C.A. cowling, which so directed the air flow around the engine that the resistance was greatly reduced. This feature was readily applied to an engine located in the nose of the fuselage, but when it was applied to the outboard engines of a multi-engined airplane, the increase in performance was not startling and often there was no improvement at all. For instance, when N.A.C.A. cowlings were applied to a Fokker trimotor in the spring of 1929, the results were quite indifferent. Experi-

ments were then started to clear up the difficulty. In May, 1929, at the annual Aircraft-Engine Research Conference, Col. V. E. Clark suggested that the N.A.C.A. investigate the effect of placing the engine nacelle and propeller in various positions forward of a wing. That suggestion resulted in a program of tests which, with many detail extensions, has been going on ever since. The results have been given in several N.A.C.A. reports, and a general review of the research and results to date was given in a paper on "Engine Nacelles and Propellers and Airplane Performance" by Donald H. Wood, aeronautical engineer of the N.A.C.A.

Joint Welding Meeting

ONE of the most successful sessions of the week was the Friday evening meeting held jointly with the American Welding Society. C. L. Eksergian, chief engineer, Budd Wheel Co., was chairman. The attendance was around 500.

The AWS and P. R. Mallory are to be congratulated on the technical excellence of the two papers, both speakers being members of the Mallory research organization. Dr. F. R. Hensel, in his presentation, "Physical Chemistry of Arc Welding", showed pictorially what happens during arc welding. He described the effect of using bare electrodes and then went into the desirability of coated electrodes for certain kinds of applications. The effect of the arc, the effects of the chemical composition of the electrode and its coating, and other factors were examined in detail and discussed in the light of available test data.

E. I. Larsen presented a paper entitled "Fundamentals of Spot Welding," which was devoted almost entirely to the characteristics of the welding electrode material and its design. Following the same procedure as Dr. Hensel, the speaker centered his discussion about graphic data resulting from actual service and laboratory testing.

Mr. Larsen showed that best results in resistance welding can be obtained only with water-cooled electrodes, and it is important in this connection to make sure that the water spaces are properly designed so as to provide the

maximum cooling effect. It was shown, on the basis of production tests, that the desirable properties of a good electrode material are a high yield point at elevated temperatures, great hardness, and resistance to annealing at high temperatures. Comparing copper, Elkaloy A, and Mallory 3 electrode

materials, the author showed that Mallory 3 is the nearest to ideal requirements. It retains its hardness better, shows practically no "mushrooming", and takes many more dressings before it is worn out.

A comprehensive series of tests gave the following results for the number of spots per inch of electrode material: Copper, 12,000; Elkaloy A, 38,000; Mallory 3, 191,000.

Amos Northup—He Writes a Paper

SOME of the grievances of the body designer could be read between the lines of a paper by Amos E. Northup, chief designer of the Murray Corporation of America, entitled "The Motor Car Produced under Ideal Conditions". Said Mr. Northup:

"What every designer dreams of is the time when he can create a line of cars without limitation as to finances, time, and 'what has been done before', or without interference from any other group. He does not want to be forced to use any certain number of dies from the previous model or to alter his design to use interchangeable dies. He does not want the release withheld for a month or two and then receive orders to have the initial models finished in six weeks or any specified time. He does not want his work continually inspected by those who are on the alert to catch any new construction and immediately tell him 'it can't be done'. He does not want any other group to tell him 'the public won't buy it'.

"In other words, he wants freedom—unrestrained freedom. He does not want to be restricted by anything or anyone.

"Every designer takes pride in originating new ideas—he is a creator and as such it is his very existence to be the originator, not the follower. It is his stock in trade to be able to compile a long list of accomplishments to his credit, which perhaps he has had great difficulty 'getting through' but which have been generally accepted by the industry and used as a standard. When he thinks how many more accomplishments he could have added to his list if he had worked under ideal conditions, because he knows how many new developments he has had ready for production and then has been unable to 'talk his point' well enough to actually get them on the road, it is overwhelming and fills him with the desire to—well, at least write a paper about it."

Just Among Ourselves

(Continued from page 119)

own statement he is simply acting in an advisory capacity, which he does not define as having anything to do with active organization.

Of the personalities which have been connected in an extramural capacity with the industry's labor problems, he possesses unquestionably the greatest potential importance. Other meetings "with" but not "called by" Father Coughlin are in prospect, and the pastor of Royal Oak is willing to admit that, if after looking the situation over he sees a chance to make effective use of his talent for organization, he may become an active "front" for

an amalgamation of some sort. If this were to come about, the labor groups in the automobile and allied industries would be articulate as they have never been before.

Not every group among the Independents would support wholeheartedly the intervention of Father Coughlin and, so far as the A. F. of L. is concerned, there is, if nothing else, the distrust of the professional for the "amateur" of social problems.

Father Coughlin told us that his National Union for Social Justice has 9,000,000 members, which takes him a little out of the amateur class as an or-

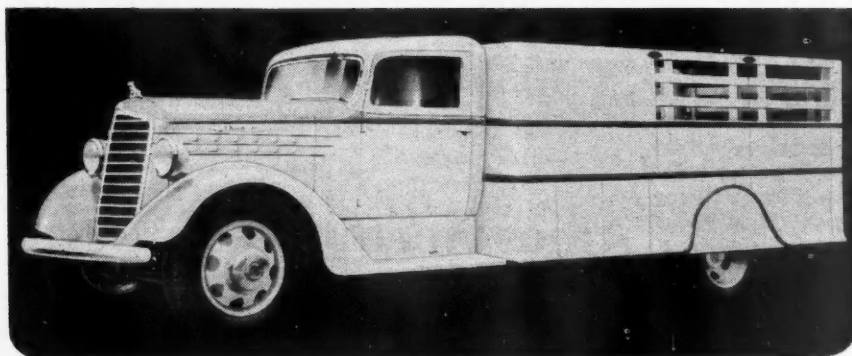
ganizer. He is willing to admit this himself, but on the other hand his program in its chameleon writhings does insist on distinctions between top and bottom in the social structure. Justice to the A. F. of L. requires pointing out that this is a little too broad and vague for its forthright mind.

Justice to Father Coughlin requires pointing out that, having taken his stand, he is to be judged, not as a priest, but as an executive. As an executive, he seems willing to rely greatly on the virtues of expedience.

"A large part of our success here," he said frankly, "has been because we have not divulged our plans in advance."

It is not irrelevant to point out, we believe, that a Greater Messiah did not scorn His John the Baptist. H. H.

Mack Enters Low-Price Truck Field



Mack, Jr., with a 166-in. wheelbase and powered by a 74-hp. six-cyl. engine

MACK TRUCKS, INC., has entered the low-price truck and bus field with a line of Mack Jr. trucks and buses in seven models, which range from a ½-ton truck priced at \$535 to a 2/3-ton truck at \$1,035. It also includes a short-wheelbase traffic-type model.

The Mack Jr. bus models, with a base price of \$2,700, are available in three designs, including two transit types and one conventional type. One of the transit-type models is available with a front-mounted engine, the other with the engine mounted in the rear. The conventional bus has an engine in front. Both trucks and buses in the Jr. line will be serviced through the company's nation-wide network of factory branches, 76 in all. The introduction of this new line marks a radical departure from the company's previous policy of manufacturing only heavy-duty commercial motor vehicles.

The ½-ton truck has a wheelbase of 118 in., and a gross rating of 4500 lb. The 1½-ton truck, with a gross rating of 10,000 lb., is available in 139-in. wheelbase, 166-in. wheelbase, and in special wheelbases ranging from 170 to 190 in. The 1½-2-ton truck, with a gross rating of 11,500 lb., is available with 139-in. and 166-in. wheelbases and in special wheelbases ranging from 170 in. to 190 in. The 2/3-ton model, with a gross rating of 13,500 lb., is available in 142-in. and 166-in. wheelbases, as well as in special wheelbases ranging from 170 in. to 190 in. The traffic type in the 2/3-ton series has a 166-in. wheelbase and this model may be had also with special wheelbases up to 190 in. and a tractor wheelbase of 139 in.

The ½-ton truck, Model 1M, is powered with a six-cylinder engine having

alloy-iron cylinders, full-pressure lubrication, Lo-Ex aluminum pistons, and Stellite valve inserts. This engine has a bore of 3 3/16 in. and a stroke of 4 3/4 in., with a 209-cu. in. piston displacement and a brake hp. of 72 at 3000 r.p.m. It has a 5.4 to 1 compression ratio and a maximum governed speed of 3000 r.p.m.

The clutch on this model is a single-plate, with 94 1/4 sq. in. frictional area. The transmission is of the three-speed direct type. The brakes are hydraulic, with an external hand-brake acting on the transmission, giving a total braking area of 170 sq. in.

The 1½-ton Model 10M truck has an engine of 209 cu. in. displacement, a clutch with 94 1/4 sq. in. of frictional area, a four-speed direct transmission, and 295 1/4-sq. in. total braking area.

The 1½-2-ton, Model 20M truck, also is powered with a six-cylinder engine, with a piston displacement of 228 cu. in., a 5.4 to 1 compression ratio, and an output of 74 hp. at 3000 r.p.m., the governed speed. It has chrome-nickel cylinders, full-pressure lubrication, Lo-Ex aluminum pistons, and Stellite valve inserts. This engine has seven main bearings, a bore of 3 3/8 in. and a stroke of 4 1/4 in. The transmission has four speeds, while a five-speed transmission is available at extra cost.

The 2/3-ton Model 30M truck, of 13,500 lb. gross rating, is powered with a six-cylinder engine with chrome-nickel cylinders, full-pressure lubrication, Stellite valve inserts, and a brake hp. of 85 at 3000 r.p.m. This engine has a bore of 3 3/8 in. and a stroke of 5 in. It, too, has seven main bearings and a maximum governed speed of 3000 r.p.m., with a 5.51 to 1 compression ratio. It uses a single-plate clutch with 131 sq. in. frictional area.

The transmission is a four-speed design, but five speeds may be had at extra cost. The brakes on this model are hydraulic, with a hand-brake acting on the transmission and a total braking area of 350 1/4 sq. in. The brakes are actuated by a BK booster.

The conventional type bus with the engine in front is available in wheelbases from 166 1/2 in. to 190 1/2 in. and seats 21 passengers. Standard equipment on this model includes an oil-bath-type air cleaner, six-volt bus electrical equipment, a radiator ornament, the instruments usually carried, a 38-gallon gas tank, two-stage springs, six tires and an insulated engine compartment. It has an engine developing 75 hp. at 2800 r.p.m., with seven main bearings. Other components include a four-speed transmission, a drop-type frame, and hydraulic brakes. The bus will be available in bodies built to customers' specifications.

The transit-type bus with the engine in front has a chassis weight of 4000 lb. and is available in wheelbases ranging from 166 1/2 in. to 190 1/2 in. It seats 21 passengers and its standard equipment is the same as that of the conventional type bus.

Appearance features of the new Mack Jr. line include large fenders, an abundance of chrome plating, a chrome grille, deluxe hub caps and bumpers, and forged disc wheels. On the 10M, 20M and 30M models a two-speed underdrive rear axle is available, of a type which is said to have been proven through years of operation. This feature permits high-speed operation over long, level stretches. By the operation of a lever in the cab, the underdrive ratio of 1.5 to 1 can be brought into operation to give ample gear reduction for hill climbing.

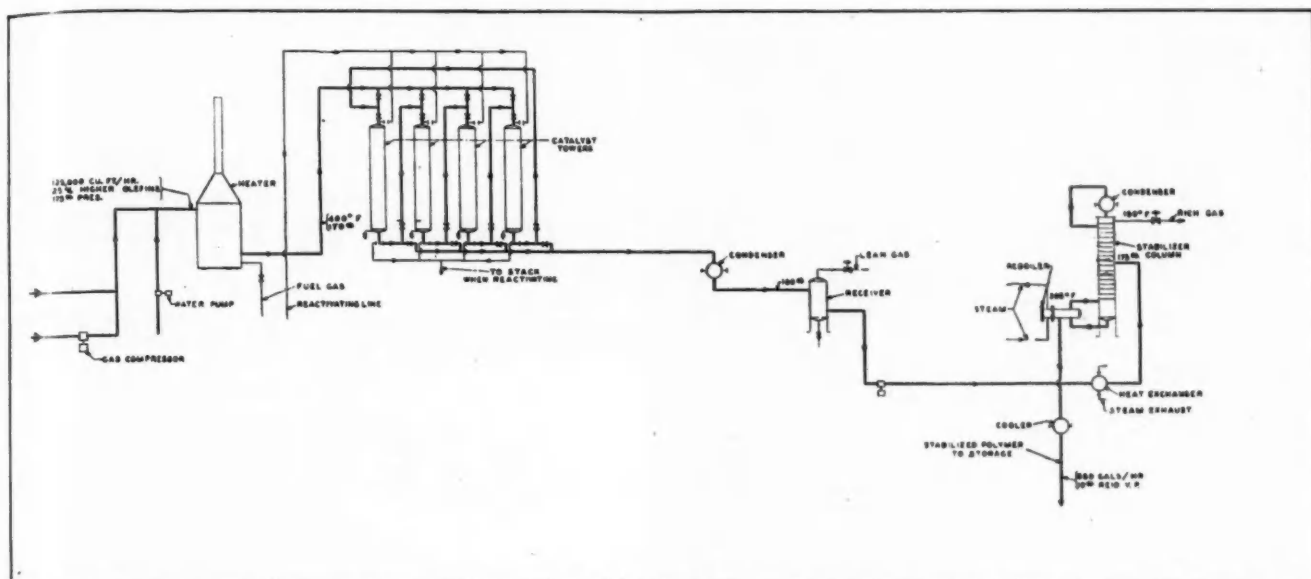


Fig. 1—Flow chart of Universal Oil Products Company's catalytic polymerization process

Universal Oil Products Co. Producing 13,600 Gal. Polymer Gasoline Daily

Table 1

Potential Polymer Gasoline

Source	Potential Polymer Gasoline Yield in Gallons
Refinery gases from crude oil.	1,000,000,000
Cracked gases	3,000,000,000
Natural gas and gasoline industries	5,000,000,000
Total.....	9,000,000,000

IN our issue of Nov. 16 we abstracted an A.P.I. paper by Cooke, Swanson and Wagner on Polymerization-Product Gasoline. This paper referred particularly to a system of gasoline production by polymerization developed by Alco Products, Inc., of New York. Some work along this line has been done also by Universal Oil Products Co. of Chicago, whose system was covered in a paper by Dr. Gustav Egloff, on the "Economic Significance of Polymer Gasoline."

Doctor Egloff pointed out that in 1934 the refinery gases from crude oil were a potential source of over 1,000,000,000 gals. of polymerized gasoline, if the propane and butanes had been dehydrogenated and the olefins polymerized. The potential yield of polymer gasoline from the propane and butanes available in the natural gas and gasoline industries, alone, was 5,000,000,000 gals. Therefore, the total polymerized gasoline potentially available in the United States was over 9,000,000,000 gals, or about 50 per cent of the gasoline used during 1934. Table 1 shows the potential supply of polymerized gasoline for the year 1935.

The flow chart of the Universal Oil Products Company's catalytic polymerization process, as shown in Fig. 1, is that of a commercial unit in operation. The cracked gas being processed is derived from the top of a stabilizer column connected to a gasoline reforming unit. The unit was designed to treat 3,000,000 cu. ft. per day of a 25 per cent olefin gas. The gas, which is available at 175 to 200 lb. per sq. in. pressure, passes through a heater, where its temperature is raised to 400 deg. F., and then in series flow through three or four catalyst towers directly under the stabilizer pressure.

The polymer vapors pass through a condenser to a receiver, where the lean gas is separated from the gasoline. The polymer gasoline is pumped to a stabilizer where the desired vapor pressure may be obtained.

The polymerization reaction is an exothermic one and a temperature rise of 100 deg. F. or so may occur. The conditions are so controlled that the polymer gasoline has a boiling range of from 100 deg. to about 410 deg. F. at 10 lb. per sq. in. Reid vapor pressure.

In a 23-day run on commercial stabilizer gas and when processing at the rate of 2,600,000 cu. ft. per day (all the gas available), the average olefin content of 27 per cent gave a yield of 5.2 gals. of 10-lb.-Reid-vapor-pressure gasoline per 1000 cu. ft. of gas, or at the rate of 13,600 gals. per day, or a total of 313,000 gals. The octane rating, A.S.T.M. Motor Method, was 81 or on a blending value basis 115.

The product of the catalytic polymerization process is a gasoline of constant quality. It has a blending value of from 103 to 125 as compared to benzol of 84 to 91 and isooctane of 94 to 99.



A line of roller bearing housings move along at SKF factory, Gothenburg, Sweden

PRODUCTION LINES

Shows Resiliency

Celeron engineers—Continental-Diamond Fiber—have a dramatic set-up to demonstrate the physical properties of the spoked-gear construction for molded timing gears. Two gears, a web-type and a spoke-type, are mounted in a machine having two rams which are raised and then dropped to produce an impact load on the gear tooth. Since the machine was set up at the S.A.E. Show in Detroit, they are consistently breaking eight teeth in the web gear for one of the spoked-type. A detailed analysis of this project will be available in these columns very soon.

On Metallurgy

Reviving a device of the humanists, Albert Sauveur has written a treatise on metallurgy in the form of a dialogue between master and pupil—questions and answers revealing the present state of the art. The book is fittingly called "Metallurgical Dialogue" and carries the weight of authority of its distinguished author, who is Gordon McKay, professor of metallurgy at Harvard. The book runs some 166 pages and is published by the American Society for Metals, from which you can buy your copy.

Covers Universe

Within the covers of a single volume, Bernard Jaffe, distinguished interpreter of scientific happenings, has packed a thrilling story of the present status of research in 13 basic fields of sci-

tific study. In "Outposts of Science" you will get an outline of what is going on in medicine, chemistry, physics, and other lines. Not only do you get acquainted with the laboratories but you have the opportunity of meeting some of the foremost figures in the scientific world. This book is a selection of the Scientific Book Club. It runs about 550 pages including a comprehensive bibliography and is profusely illustrated. Publishers, Simon and Schuster. Price \$3.75 the copy.

For Maintenance

A good cross-section of practice in handling the work of the maintenance department is found in a study recently completed by the Policyholders Service Bureau. This study, entitled "The Maintenance Department," represents the policy of a large group of manufacturing concerns in a variety of lines. Operation, controls, budgets, and costs are briefly discussed. We recommend it to every one concerned with plant maintenance.

Symposium Defined

In engineering circles we have a lot of symposiums during the course of a year. Of course everybody knows what a symposium is. However, a distinguished English scientist upset a group of American scientists recently when he asked them for our definition of the word. On the evidence of our own Vize-telly, symposium is defined as a "drinking together, a convivial feast or banquet." It comes from the ancient

Greeks who were past masters in the art of drinking and drinking usually led to learned discussions. Perhaps our way of doing it is much like the Greeks except that we reverse the process—let the drinking follow.

Product Schedules

One of the most important activities in the manufacturing department is the development and operation of work scheduling. You know how it is in a car assembly plant where many body models, a great variety of color and trim options, etc., would snarl things hopelessly were it not for some clever scheduling technique. Every one has his own way of handling the job and in each case the method is foolproof, to all intents and purposes. But recently something happened in one of the big plants. Some operator took a sizable number of bodies off the line and didn't report his action. Things began to happen and in a short time the entire assembly process was in a hopeless tangle. It was necessary to close down and straighten it out. Which only goes to show how well the system really operates and how vital a good scheduling system is.

Colloidal Graphite

A little booklet on colloidal graphite is being distributed by Acheson Colloids. It's the first 1936 edition and contains in brief form the currently known facts concerning the mechanism of colloids, and colloidal graphite in particular. The latest uses of this material in the automotive industry are given in some detail.—J. G.

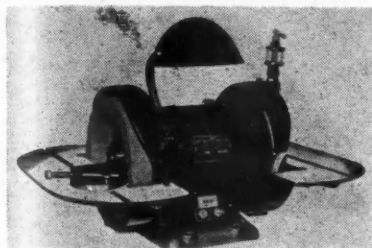
MANUFACTURING
MANAGEMENT
METALLURGY

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

New Grinder for Cemented Carbide Tools

The new model AA Prosser Wide cemented carbide tool grinder is equipped with two quick setting tables, planed and slotted with graduated indexes. This machine permits both rough and finish grinding of cemented carbide tools to accurate angles with flat surfaces. The finishing wheels may be either of fine-grain silicon carbide or diamond impregnated. An oil feed-



**Prosser Grinder for
cemented carbide tools**

ing attachment is furnished when diamond wheels are used, which permits keeping the face of the wheel well oiled. This grinder is a product of Thomas Prosser & Son, 15 Gold Street, New York City.

Elwell-Parker Truck Uses Higher Voltage

On the type ERX-6T electric truck, manufactured by The Elwell-Parker Co. of Cleveland, the electrical problems involving the handling of heavy currents are said to have been solved by adopting higher voltages than are usual in industrial truck design. Standard batteries however can be used, a switch being provided so that the batteries are charged in multiple and discharged in series.

This truck is capable of transporting, lifting and lowering a 6000-lb. load, and develops a traveling speed of 525 ft. per minute. Power for lifting and lowering is delivered through roller chains, in duplicate, having a safety factor of 9. The truck is provided with three motors—for traveling, hoisting and tilting respectively. The tilting mechanism operates in both directions, forward to facilitate inserting the forks underneath the load and backward so the load can be carried more nearly over the wheelbase. Regenerative braking on the hoisting mechanism returns current to the battery whenever a load is lowered.

The Wheelabrator cleans by throwing an abrasive against the work to be cleaned.



Airless Abrasive Cleaning in Wheelabrator

The American Wheelabrator is a mechanical device for throwing abrasive by centrifugal and tangential force onto

products to be cleaned, such as castings or forgings, or for the preparation of a base finish such as the satin finishing of metal stampings. From an overhead storage bin the abrasive flows through a chute via a manually controlled feed gate to the Wheelabrator unit, where a patented control device is said to direct all the material on the work to be cleaned. The spent abrasive drops down to a hopper underneath the work and a screw conveyor carries it through a rotary screen from which it is elevated to the original container. This equipment has been developed by The American Foundry Equipment Co., Mishawaka, Ind.



**Type ERX-6T Industrial
Truck**

Hydraulic Pump for Machine Tool Feeds

A new hydraulic pump, control valve and hydraulic circuit has been developed by the Sundstrand Machine Tool Co., Rockford, Ill., for machine tool feeds and other applications. A con-

stant displacement pump and a variable displacement pump are both contained in a single housing, and driven by a single shaft. The constant displacement pump is a Sundstrand Rotameter type, while the variable displacement pump is said to be of entirely new design. It is of the multiple piston type, having two pre-set rates of feed, both of which are adjustable throughout their entire range.

The Sundstrand hydraulic circuit is said to be a self-locking circuit which provides smooth, uniform feed, shockless high-speed traverses, and prevents the tool from jumping ahead at the

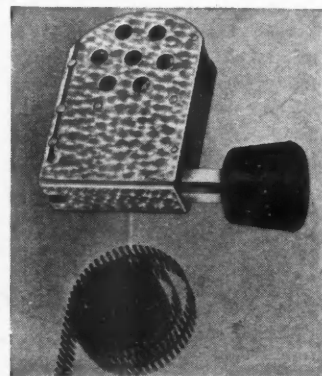


Sundstrand Pump for machine tool feeds

completion of a cut or during an intermittent cut. The control valve provides rapid approach, feed, adjustable dwell, and rapid return for the tool.

Paslode Thousand Load Tacker

A new vest-pocket size stapler with a magazine which carries 1000 staples in a single load has been announced by the Paslode Co., Merchandise Mart, Chicago. Ease of operation is said to be an outstanding feature of this tacker. The staples are furnished in a compact roll of 1000 which are easily inserted in the magazine, and provision is made



against the possibility of clogging. This device is designed for use in the shipping department for attaching tags and labels.

Paint in Stick Form

Markal is the name of a new product being marketed by Helmer & Staley, 2560 S. Parkway, Chicago. This paint in stick form is said to be easily applied to a wet or dry surface, and is supplied in two types, one for cold, the other for hot marking. For cold work Markal can be used on structural steel, galvanized iron, glass, lumber, building stone, etc. For hot working it can be used on forgings, castings, etc., at any temperature between 300 and 1200

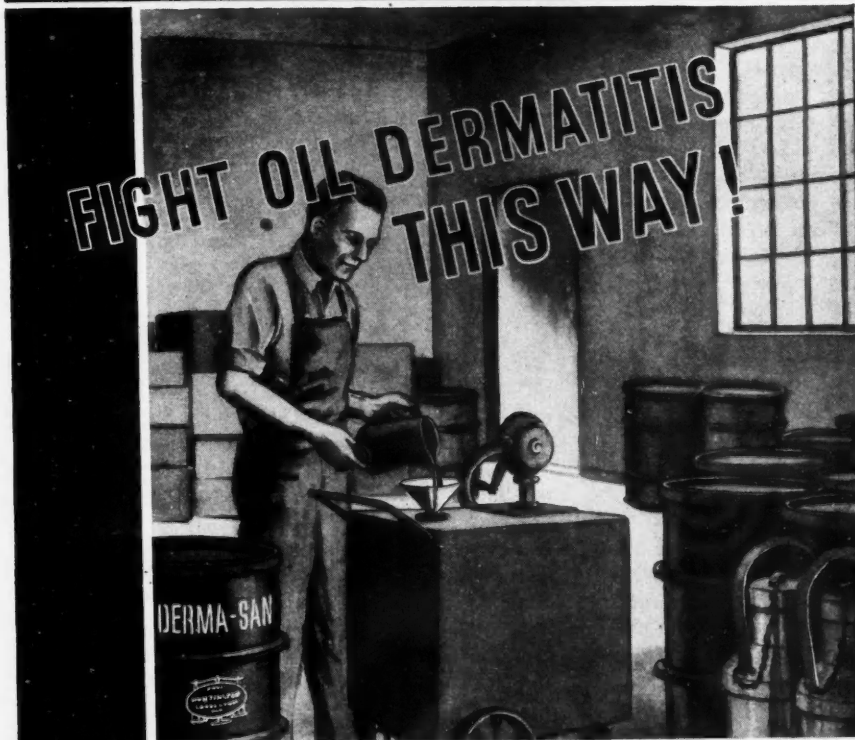
The Horizons of Business

(Continued from page 118)

magnitude of the debt are not the real causes of alarm. The country can easily handle an extraordinary expenditure of two billions and service adequately a debt of \$32 billion. It is the trend of the debt and the use of the proceeds which occasion alarm. The various compromises with fiscal rectitude which the government has countenanced during the past three years have made further denial of the veterans impossible. The "gentle rain of checks" has proved so soothing to large groups that it may prove fatal to the party which has the courage to halt them.

DERMA-SAN

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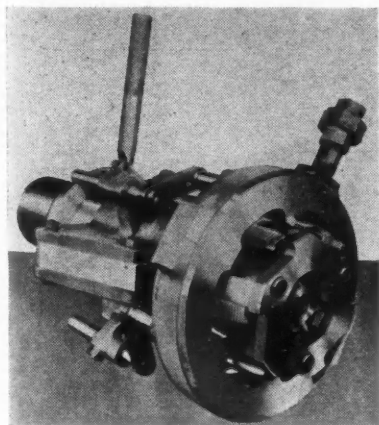
Derma-San is ideal for all general plant sanitation

The HUNTINGTON LABORATORIES Inc.
DENVER HUNTINGTON, INDIANA TORONTO

deg. F. This material is claimed to be as weatherproof and permanent as any other high-grade paint. It can be furnished in several different colors.

Oil Type Trip Ring For Collapsible Taps

When tapping any threads, particularly long threads of large diameters in steel, it is essential to maintain an ample supply of lubrication to dissipate the heat and wash away the chips. To insure a sufficient supply of lubricant for its line of collapsible taps the Landis Machine Company of Waynesboro, Pa., has placed on the market an oiling type of trip ring to replace the conventional type. The ring consists of a hollow housing with steel plates mounted on the front and back, thus forming a reservoir for holding the lubricant. On the smaller sizes the housing is made of cast iron and for the larger rings is made of aluminum. The front ring which contacts the work to effect the receding and collapsing action of the tap is made of steel and case carburized to resist wear.



Landis Oil Ring

Holes are placed diagonally in the housing through which a stream of oil is forcibly directed upon each chaser throughout the entire length of the cut, thus insuring ample lubrication at the point where it is needed.

Sheet Metal Easily Unloaded

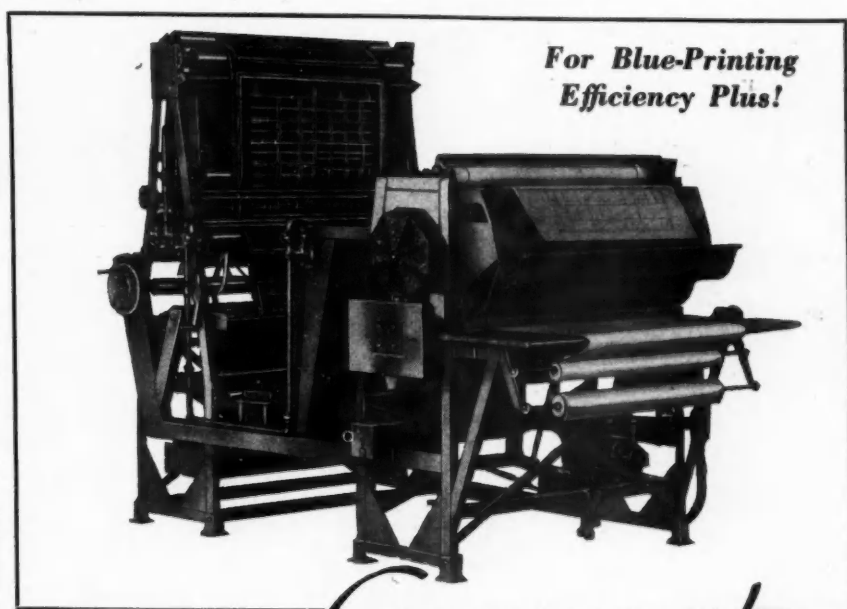
A new swivel fork attachment for the Baker Hy-Lift industrial truck is said to be a great aid in unloading packaged sheet metal from freight cars. When applied to the 55-in. platform of the 5-ton truck it is possible to handle

steel in bundles up to three tons in weight, 30 in. in width, and 96 in. in length. With the packs of sheet metal loaded crosswise in a freight car, the forks are slipped under the pack, the platform with the forks is then raised, and the entire load is swung through 90 deg. so that it lies lengthwise of the truck as shown. In this position it can easily be moved out of the car.

The Baker-Raulang Co., Cleveland, Ohio, has developed this swivel fork attachment, which can be easily removed if it is desired to use the truck for general service.



Baker Hy-Lift Truck



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Efficiency Plus!*

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Here is the blue-printing machine you have been waiting for—a truly high grade, continuous, Blue-Printing, Washing, and Drying Equipment—at a price nearly \$1,000.00 less than any other continuous blue-printing equipment.

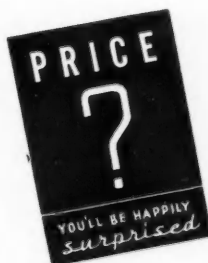
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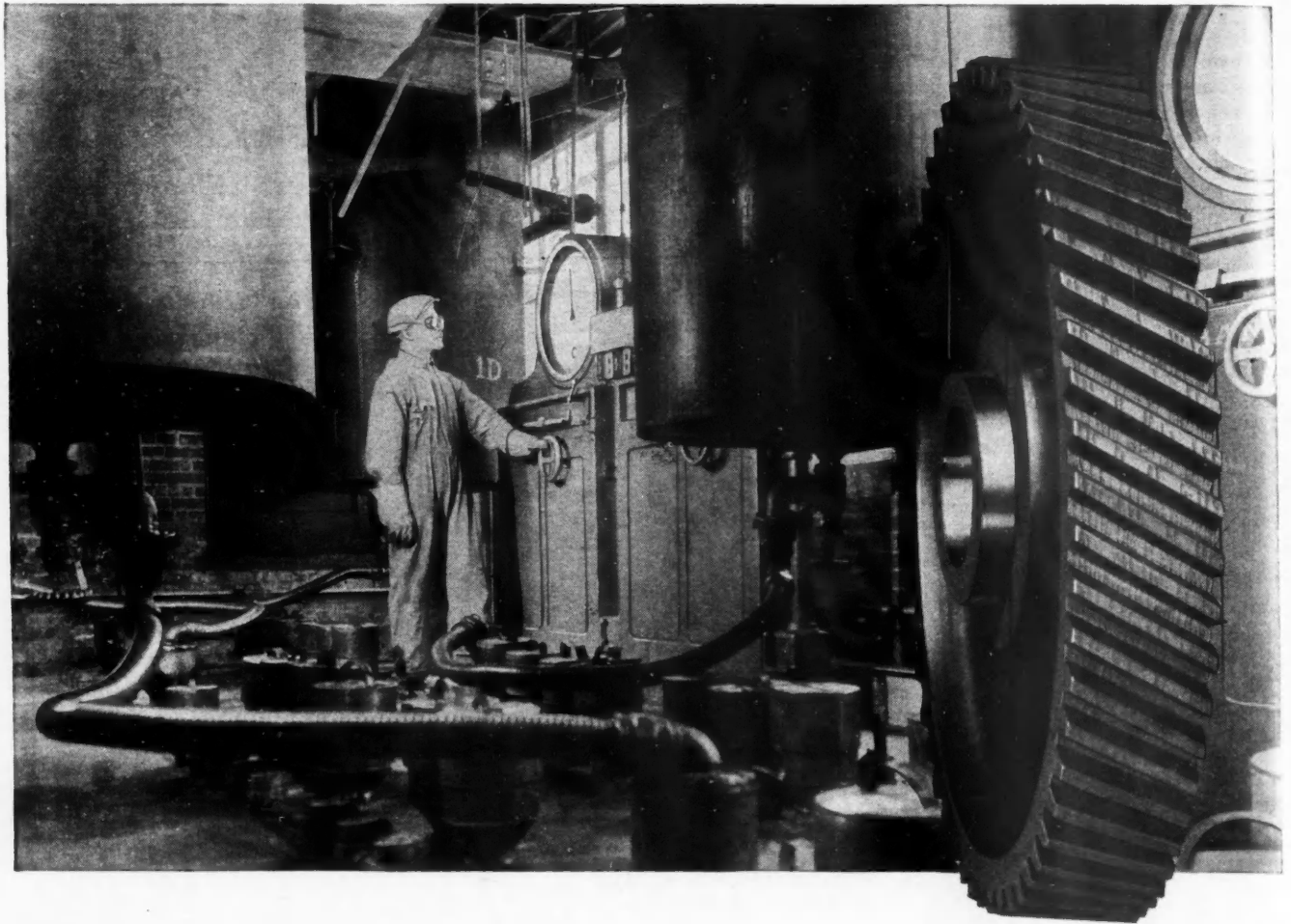
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January 25, 1936

Automotive Industries